Office of Oversight
Environment, Safety and Health

Follow-up Review of Integrated Safety Management at the

Los Alamos Neutron Science Center

November 1999

Integrated Safety Management

Executive Summary

SPECIAL STUDY:	Office of Oversight Follow-up Review of the Los Alamos Neutron Science Center
SITES:	Los Alamos National Laboratory
DATES:	October-November 1999

Scope

The U.S. Department of Energy (DOE) Office of Oversight, within the Office of Environment, Safety and Health, performed a follow-up review of the Los Alamos National Laboratory (LANL). The follow-up review focused on selected LANL integrated safety management (ISM) initiatives as they are applied to the Los Alamos Neutron Science Center (LANSCE) research and development (R&D) activities.

The LANL ISM initiatives are essential for addressing systemic issues that were identified in a 1996 Type A accident investigation of an accident involving an electrical shock at LANSCE. As part of the ISM efforts, LANL committed to implement Safe Work Practices and Facility Safety Plan initiatives in 1999; these programs require LANL R&D efforts to adopt a more formal and rigorous approach to safety. The Office of Oversight conducted an accident investigation follow-up review in January 1998, concluding that progress had been made but that additional work on the ISM efforts was needed to continue addressing several of the judgments of need identified in the 1996 microwave accident investigation.

In this 1999 follow-up review, the application of Safe Work Practices on selected projects and R&D activities was evaluated against the five core functions of ISM. Selected aspects of LANSCE implementation of ISM were also examined, including line management responsibility for safety; clear roles, responsibilities, and authorities; and identification and flowdown of requirements. This Office of Oversight follow-up review was conducted in coordination with the 1999 DOE ISM system verification and the DOE environment, safety, and health special assessment reviews.

Results

LANSCE management is committed to ISM implementation and has provided the necessary leadership to make significant progress in developing and implementing ISM over the past two years. For example, LANSCE management has continued to address the judgments of need from the microwave Type A accident investigation through various actions, including the ongoing ISM efforts. This 1999 Office of Oversight review concluded that LANSCE management has now adequately addressed all of the microwave accident judgments of need reviewed by the Oversight team.

As part of the ISM effort, LANSCE has developed and is implementing new programs for managing safety in a rigorous and disciplined manner, consistent with DOE expectations. These programs include the Facility Safety Plan, subordinate facility-tenant agreements, and the Safe Work Practices process. These programs establish requirements for R&D activities and are a positive step toward a comprehensive program for defining and analyzing hazards, and implementing controls to ensure that research, experiments, and associated support activities are performed safely. As with any new and complex system, these programs are continuing to evolve and have weaknesses that have not yet been fully addressed. Notwithstanding these weaknesses, the new programs are a major accomplishment considering the efforts that were needed to establish a safety management program at a complex that historically did not have a rigorous and formal approach to R&D work control. Recognizing the need for continued improvement, LANSCE is actively working to revise these

programs, including establishing the lead tenant and Experimental Area Manager functions to provide better control of operations and experiments.

LANSCE management is fully involved in support of safety, as evidenced by a safety-conscious decision to stand-down operations in 1999 to improve safety after a number of incidents were noted that could have resulted in more serious safety concerns if allowed to persist. Work activities, research and experiments, and operations are consistent with the descriptions presented in the Facility Safety Plan. Researchers and line management are generally knowledgeable of hazards in their workplace and well trained in the identification and analysis of workplace hazards. Some aspects of safety management were notably effective, such as the LANSCE machine shop, which had an excellent safety record, a rigorous operator qualification program, and a full-time machinist to manage the shop and control the hazards.

Although much progress has been made, substantial work remains, including numerous tasks identified in the LANSCE ISM improvement plan. The LANSCE plan identifies systemic weaknesses and required management actions, including issues similar to those identified by the Office of Oversight team during this review. To ensure full implementation of ISM at all levels, in particular at the group and activity level, LANSCE should increase attention on the following areas:

- Further define and complete the ongoing improvements and initiatives in the "TA-53 LANSCE Planning for ISM Improvement Plan." Coordinate those improvements with other essential management initiatives (e.g., outage management) as part of LANSCE's overall strategic approach to managing resources, scheduling, and tracking activities. Integration of these important initiatives with the LANSCE division strategic plan is particularly important so that management systems not only address ISM issues, but also ensure effective and efficient use of LANSCE's available resources to effectively implement ISM.

- Strengthen the integration of the LANSCE Facility Safety Plan and facility-tenant agreements through development and implementation of required authorization basis and other subordinate documents to fully define safety envelopes and operating limits that directly apply to LANSCE facilities and buildings.

- Ensure that all onsite R&D work activities are implemented according to the requirements and guidance of the LANL Safe Work Practices and other institutional laboratory requirements. Particular attention should be focused on improving the integration of environment, safety, and health support services and stressing adherence to requirements, particularly for work activities involving R&D programmatic equipment and work not fully addressed by hazard control plans.

- Increase management attention to performance feedback and continuous improvement processes to ensure that ongoing ISM improvement efforts achieve their objectives. Recent occurrences indicate a need to strengthen the discipline, rigor, and adherence to Safe Work Practices. Timely improvement in management feedback systems, particularly self-assessment and corrective action programs, are necessary to provide continued assurance that ISM is effectively implemented and that processes are in place to provide for continuous improvement.

In addition, LANL needs to accelerate the development, issuance, and implementation of institutional requirements and guidance to address important safety-related areas, including authorization basis and Safe Work Practices processes. Improvement in several institutional processes, such as stop-work and critique processes, are also required to fully support their implementation at LANSCE and other LANL divisions. Further, management systems for flowdown of requirements to the divisions should be strengthened through improved integration of environment, safety, and health subject matter experts and increased emphasis on providing additional clarifying guidance for requirements implementation.

Conclusions

LANSCE has made good progress since the 1998 Oversight review and has several initiatives in progress to further improve environment, safety, and health systems and fully implement ISM. While much work remains, LANSCE management has a good understanding of current weaknesses and has efforts in place to make the needed improvements. Continued management attention and leadership are needed to ensure that ongoing and planned actions are fully implemented and achieve their objectives. While LANL

has established fundamental systems to support the implementation of ISM across the laboratory, improvements are needed in some areas in order to fully apply these systems to effectively implement key ISM initiatives, such as Safe Work Practices and Facility Safety Plans, at the division level.

OVERVIEW OF ISSUES FOR FOLLOW-UP AND CORRECTIVE ACTIONS

- LANSCE does not have a sufficiently formal process for dissemination of requirements that ensures that all new and modified requirements effectively flow down to the work activity level and are reviewed to determine training and guidance needed to support implementation, in accordance with Laboratory Implementing Requirement 301-00-01.9, "Issuing and Managing Laboratory Operations Implementation Requirements and Guidance." The effective flowdown of requirements has also been hindered by other institutional factors, including the high rate at which institutional requirements have been promulgated, the lack of sufficient environment, safety, and health subject matter expert involvement, and the lack of sufficient institutional guidance in some cases.

- The LANSCE Facility Safety Plan and associated facility-tenant agreements do not fully meet the intent of applicable LANL requirements, including requirements for identifying safety envelopes and operating limit information, and analyzing aggregate hazards between and within multi-tenant buildings.

- The Los Alamos Area Office, LANL, and LANSCE have not effectively managed the review, development, and approval process for authorization basis documents in a timely manner, in accordance with applicable DOE requirements and standards.

- The LANSCE hazard analysis process does not provide for sufficient documentation and environment, safety, and health subject matter expert involvement, consistent with the LANL Safe Work Practices requirements documents, when identifying and analyzing some industrial and radiological hazards (e.g., working at elevated heights and exposing materials to the neutron beam).

- At LANSCE, institutional controls (e.g., procedures and training) for some work activities are not adequately identified, documented, or linked to work activities. Clear linkage of LANL institutional requirements and controls to work activities is required by the LANL ISM description document.

- At LANSCE, comprehensive building emergency plans have not been fully developed or demonstrated to be effective through documented drills and exercises, as required by applicable U.S. Occupational Safety and Health Administration and DOE order requirements.

- At LANL, the stop-work procedures do not fully implement the requirements of DOE Order 440.1A and the intent of DOE Order 5480.19, as referenced in institutional requirements. This weakness was previously identified by the Office of Oversight.

- LANL institutional processes for critiques do not fully implement DOE Order 232.1 requirements for investigation of abnormal events. The lack of a formal process demonstrated the need for more effective critique processes, as observed by Oversight at the division level.

- At LANSCE, an effective self-assessment program, consistent with DOE requirements for self-assessments (as delineated in Laboratory Implementing Requirement 307-01-01, "Safety Self-Assessment") is not in place to provide continued assurance that ISM, particularly Safe Work Practices, remains adequately implemented and is continuously improved at the group and activity levels.

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Oversight, within the Office of Environment, Safety and Health (EH), conducted an independent oversight follow-up review of the Los Alamos National Laboratory (LANL) from October 12 through October 22, 1999. This review focused on research and development (R&D) activities at the Los Alamos Neutron Science Center (LANSCE).

LANSCE has a high-intensity, multiple-use accelerator used primarily for R&D. Potential hazards include those of an electrical nature (e.g., high-voltage systems, high-current electromagnet systems, and industrial-type power substations and distribution lines to accommodate 25 MW power load) and radiological hazards (from beam energy/ intensity).

This Office of Oversight review focused on activities at the Los Alamos Neutron Science Center (LANSCE).

This review focused on those site organizations directly responsible on a day-to-day basis for work activities at LANSCE. Within the LANL sites, the selection of LANSCE as a focus of review enabled the Office of Oversight to evaluate R&D work activities with different responsible work organizations. In addition, certain activities performed by the Los Alamos Area Office (LAAO), such as line management assessments, were reviewed. LAAO is the organization within the Albuquerque Operations Office (AL) with primary responsibility for operations and environment, safety, and health (ES&H) at LANL. Figure 1 provides a simplified version of the LANL and LANSCE organizational structures.

This follow-up review was conducted in coordination with the October 1999 DOE integrated safety management (ISM) system verification and the DOE ES&H special assessment reviews. To avoid duplication of effort and unnecessary overlap of EH activities, this Oversight review focused primarily on LANSCE operations. Issues and observations that could have implications outside of LANSCE were discussed with personnel participating in the two ongoing reviews mentioned above.

In 1998, the Office of Oversight conducted a follow-up review that examined progress on judgments of need identified in an accident investigation report for a 1996 microwave accident at LANSCE.

The LANSCE facility was the site of a July 11, 1996, microwave accident and a subsequent Type A accident investigation. The Office of Oversight conducted a follow-up review in January 1998 that addressed the microwave accident as well as two other Type A accidents at LANL. The January 1998 follow-up review concluded that line management was establishing a good foundation for improving safety and establishing the management systems that would help to prevent accidents from recurring. However, at the time of the 1998 review, the Office of Oversight team concluded that AL and LANL had closed a number of corrective actions before the actions were fully completed and verified to be effective. In addition, several key initiatives, including implementation of Safe Work Practices (SWPs) and Facility Safety Plans (FSPs), were scheduled for completion following the 1998 Oversight review as part of the LANL ISM program effort. These initiatives were important in that they required LANL to adopt a more formal and rigorous approach to safety management for its R&D efforts.

This 1999 Oversight review focused on the effectiveness of implementation of integrated safety management in correcting previously identified weaknesses.

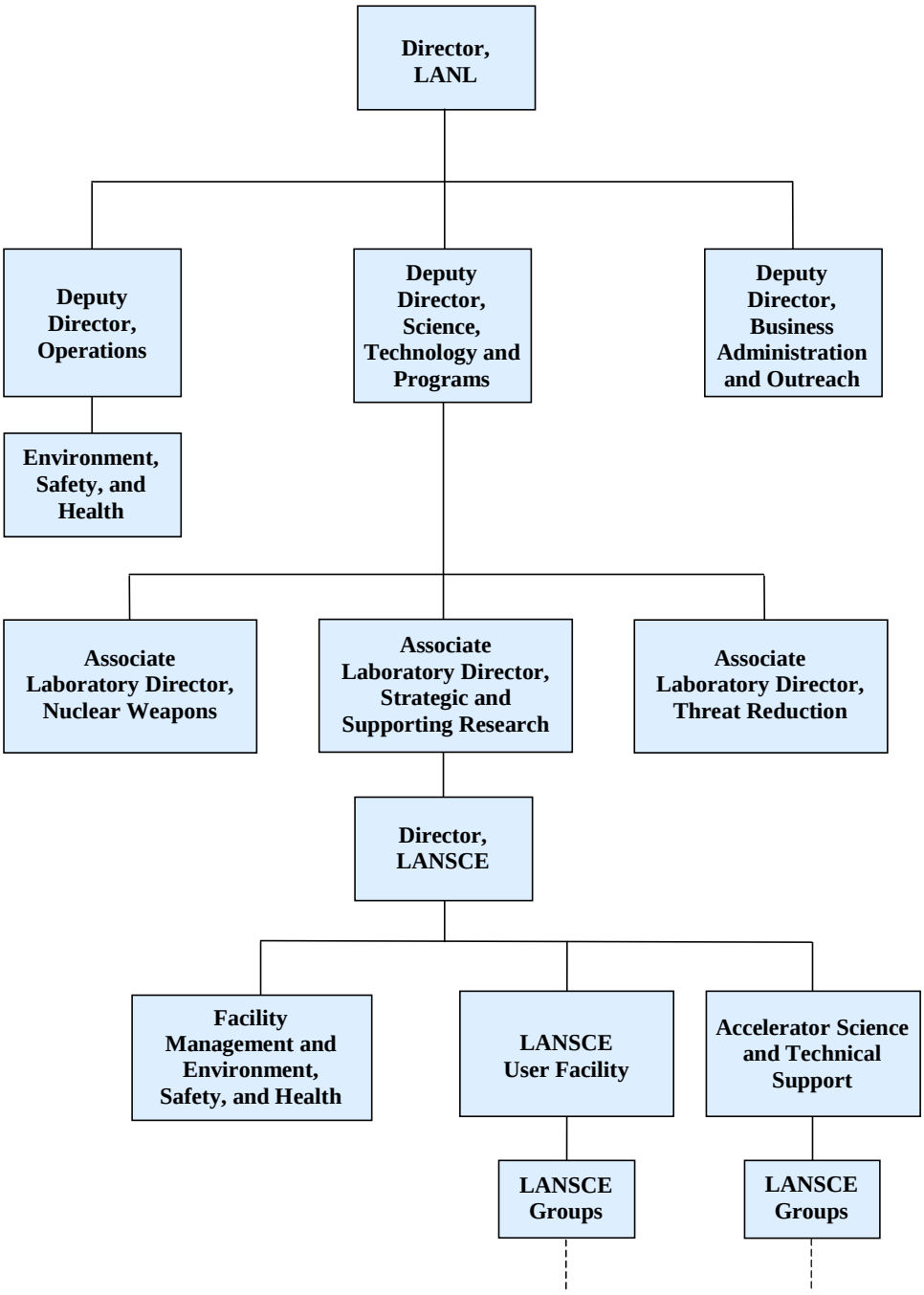


Figure 1. Simplified Organizational Structure for LANL and LANSCE

This 1999 review focused on providing feedback to AL, LAAO, and LANL line management on the effectiveness of the ISM program in implementing long-term corrective actions to address systemic weaknesses reflected in a number of the judgments of need (JONs) from the Type A accident investigation of the microwave accident. As a part of this effort, this Oversight follow-up review examined the effectiveness of LANL FSPs and work control practices for R&D activities. The review activities included observations of ongoing activities, facility walk-throughs, interviews, document reviews, and examination of several safety management program elements (e.g., clear roles, responsibilities, and authorities for safety).

In addition to the January 1998 accident investigation follow-up review, the Office of Oversight participated in five other evaluations at LANL since 1995 (see summary of previous Oversight evaluations in text box on page 7). In November 1995, the Office of Oversight conducted a Type A accident investigation following a forklift accident that injured a LANL technical staff member. In January 1996, Oversight conducted a Type A accident investigation following a severe injury to a LANL subcontractor craftsperson who contacted a 13.2-kilovolt electrical cable while excavating with a jackhammer. In July 1996, the Office of Oversight conducted a Type A accident investigation following a non-fatal electrical shock to a student. In August through October 1996, the Office of Oversight conducted a safety management evaluation to determine how effectively DOE and LANL line management were implementing safety management and ES&H programs at LANL. In March and April of 1998, the Office of Oversight examined the LANL emergency management program as part of a complex-wide assessment of emergency management programs.

Section 2 of this report includes an assessment of line management's implementation of ISM at LANSCE, as well as an evaluation of ISM implementation as reflected in each of the five core functions. Section 3 provides opportunities for improvement. Issues arising from this review that require formal tracking and follow-up are summarized in Appendix A. Appendix B lists Type A microwave accident JONs that were determined not to be fully satisfied from the 1998 EH accident investigation follow-up review and their current status. Appendix C identifies the Office of Oversight personnel who participated on this 1999 review.

OVERVIEW OF LOS ALAMOS NATIONAL LABORATORY SITE

The Los Alamos National Laboratory (LANL), established in 1943, consists of 47 technical areas occupying approximately 43 square miles of Department of Energy (DOE) land situated in northern New Mexico. LANL is located approximately 35 miles northwest of Santa Fe, which is the closest large metropolitan center.

MISSION: LANL was originally founded and established as Project Y of the Manhattan Project. The laboratory's central mission is to reduce the danger of nuclear weapons and nuclear materials worldwide, and consists of the following five areas: (1) stockpile stewardship, (2) stockpile management, (3) nuclear materials management, (4) non-proliferation and counterproliferation, and (5) environmental stewardship. LANL conducts extensive research in energy, nuclear safeguards and security, biomedical science, computational science, environmental protection and cleanup, materials science, and other basic research.

SITE MANAGEMENT: LANL is managed by the regents of the University of California pursuant to a management and operating contract with DOE. The University of California has managed the laboratory since its inception in 1943. LANL has approximately 8,550 full-time-equivalent personnel. The Los Alamos Area Office (LAAO), a part of the Albuquerque Operations Office, administers the contract with the University of California and oversees contractor operations at the site. There are 75 DOE and support contractor personnel assigned to LAAO. The Office of Defense Programs (DP) is the LANL lead program secretarial office and site landlord. A number of other offices have programmatic interests at LANL. DP and the DOE Offices of Nonproliferation and National Security and Environmental Management have interests in national security and environmental programs. The Office of Science and the Office of Nuclear Energy, Science and Technology have interests in LANL's science and technology programs.

SUMMARY OF PREVIOUS OVERSIGHT EVALUATIONS AT LANL

Forklift Accident – November 22, 1995: A LANL technical staff member was positioning a forklift on a sidewalk outside Building 128 at Technical Area 35 when the left rear wheel slipped over the edge of the sidewalk, toppling the forklift on its side and pinning the staff member's neck and foot. The staff member, who was not licensed to operate the forklift, was using the forklift to assist a subcontractor in moving gas cylinders to ensure adequate gas flow to his instruments over the Thanksgiving holiday. The driver was extricated and hospitalized and recovered from his injuries. The Type A accident investigation board, appointed on November 27, 1995, determined the root cause of the accident to be a lack of controls to ensure that only licensed operators operate forklifts. The board identified eight judgments of need (JONs). The *Type A Investigation Report of a Forklift Accident at Los Alamos National Laboratory on November 22, 1995* provides more detailed information.

Jackhammer Accident – January 17, 1996: A LANL subcontractor crafts person contacted a 13.2-kilovolt electrical cable in the basement of Building 209 at Technical Area 21 while excavating with a jackhammer. The excavation was part of a waste stream corrections project. The crafts person suffered severe burns and cardiac arrest. The Type A accident investigation board, appointed on January 23, 1996, identified seven root causes of the accident, including the failure of LANL management systems to correct longstanding, well-defined programmatic weaknesses. The board identified 29 JONs. More detailed information is contained in the *Type A Accident Investigation Board Report on the January 17, 1996, Electrical Accident with Injury in Building 209, Technical Area 21, Tritium Science and Fabrication Facility, Los Alamos National Laboratory,* available on the Office of Oversight home page.

Microwave Accident – July 11, 1996: A LANL student employee received a 4,000-volt electrical shock while conducting electrical measurements on a commercial microwave oven at Technical Area 53, Building MPF-14. The student employee sustained several burns, dislocated both shoulders, and was hospitalized for eight days. Investigation into the event revealed that a grounding clip was incorrectly connected, creating the unexpected electrical shock hazard. The Type A accident investigation board, convened on July 12, 1996, determined the root causes of the accident to be management's failure to ensure safety, management's failure to implement electrical safety requirements uniformly, and the individual's failure to work safely to protect himself and his co-workers. The board identified eight JONs. More detailed information is contained in the *Type A Accident Investigation Board Report, July 11, 1996, Electrical Shock at Technical Area 53, Building MPF-14, Los Alamos National Laboratory***,** available on the Office of Oversight home page.

LANL Safety Management Evaluation – October 1996: This evaluation concluded that although initiatives were under way, the safety management program at LANL was not achieving the desired level of performance. There were weaknesses identified in many of the ES&H programs, most notably work planning and control, conduct of operations, maintenance, and electrical safety. More detailed information is contained in the *Independent Oversight Evaluation of Environment, Safety, and Health Programs at the Los Alamos National Laboratory* (October 1996), available on the Office of Oversight home page.

LANL Accident Investigation Follow-up – January 1998: This review concluded that safety improvement efforts under the auspices of ISM and other related initiatives collectively provided a good foundation for addressing safety issues and establishing the management systems that will help to prevent accidents from recurring. However, increased management attention was needed to address continued weaknesses in implementation of facility and activity level procedures, particularly in the areas of work planning and control and electrical safety. More detailed information is contained in the *Follow-up Review of Accident Investigations at the Los Alamos National Laboratory* (January 1998), available on the Office of Oversight home page.

Special Study of Emergency Management Programs at LANL – March 1998: This review noted improvements resulting from the establishment of an incident command system, as well as the effective responses to recent wild fires and other site hazards. Also, the LANL hazardous materials response team activities and the LANL medical support program were identified as noteworthy practices. Several remaining weaknesses were identified for management attention, including: strengthening the hazards assessment process, controlling hazardous chemicals, and improving protective action guides, emergency response procedures, training, and overall preparedness planning. The *Independent Oversight Evaluation of Emergency Management Programs Across the DOE Complex* (August 1998) provides more detailed information.

2.0 Results

The results of the EH follow-up review of LANL are presented in two subsections. The first addresses the status of selected aspects of ISM at LANSCE, and the second addresses the core functions of safety management at LANSCE. The review of ISM focused on line management functions performed by LANSCE senior management and the LANSCE safety organization, while the review of core functions focused on implementation of processes at LANSCE at the facility and activity level by research organizations.

2.1 Implementation of Integrated Safety Management

This review of ISM at LANSCE focused on three areas: (1) line management responsibility for safety; (2) clear roles, responsibilities, and authorities; and (3) the identification and flowdown of requirements. These areas were selected based on weaknesses noted in previous Office of Oversight evaluations and reviews, as well as information gathered during the planning process about the status of ISM implementation. Although this review focused exclusively on LANSCE, the Office of Oversight team examined certain elements of LANL's institutional ES&H programs to determine their effectiveness as they relate to ISM implementation at LANSCE.

Line Management Responsibility for Safety

Organizations that have effective safety management programs place responsibility for safety with line management. Accordingly, line management must ensure that the safety management program includes safety policies and goals that are clearly articulated and communicated, and that workers are fully involved in safety issues and take appropriate action when hazards are encountered during normal and emergency conditions.

Policy and Leadership. At the institutional level, LANL senior management has established policies and provided the leadership necessary to promote implementation of ISM at LANSCE. LANL management supports the concept of ISM and recognizes that line management is responsible for the protection of the public, the workers, and the environment. LANL has developed the appropriate institutional policy statements that express strong commitment to protecting the environment and the safety and health of workers. LANL's policies explicitly state that operational needs must not compromise safety. Understanding and acceptance of the guiding principles and core functions of ISM are further articulated in the laboratory's ISM description document (LAUR-98-2837, Rev. 3), which serves as the basis for ISM implementation at LANL.

LANSCE management is providing the leadership necessary to continue to make improvements in implementation of ISM.

Within the framework of the LANL institutional program, LANSCE management is providing the leadership necessary to continue to make improvements in the division's implementation of ISM. At the time of the 1998 Office of Oversight review, LANSCE had adequately addressed some of the JONs and was making good progress on others through the ISM initiatives. Since that time, LANSCE management has adequately addressed the microwave JONs reviewed by the Office of Oversight team through various actions, including the ongoing ISM efforts. Further, LANSCE has made progress in implementing many of the required elements of ISM. For example, since the 1998 Office of Oversight review, LANSCE has implemented the SWP program, which is the LANL mechanism for applying the five core functions of ISM to research and related experimental activities. In addition, LANSCE

Aerial view of Technical Area 53

developed its FSP in 1998 and completed an annual revision on schedule in 1999.

LANSCE management demonstrated its commitment to safety, including directing a safety stand-down in a proactive effort to improve safety.

Over the past two years, LANSCE management has demonstrated its commitment to safety on several occasions and its willingness to proactively address safety issues. As one example, early in 1999, senior management directed a safety stand-down of the entire LANSCE division in a proactive effort to improve safety. They took this action after the LANSCE facilities had experienced a number of events and instances of procedure non-compliance. Although none of the events was a significant safety concern when viewed individually, LANSCE senior management made the safety-conscious decision to stand-down operations to identify and correct factors that could have resulted in more serious safety concerns if allowed to persist. In light of the cost and operational impact on research programs, the decision to stand-down demonstrates LANSCE management's priority on safety and acceptance of the LANL policy to not compromise safety for operational needs.

As another example of management involvement and commitment, LANSCE management directed development of the "TA-53 LANSCE Planning for ISM Improvement Plan." This plan is designed to identify and track issues, systemic weaknesses, and required management actions. The LANSCE plan identifies many significant weaknesses that require corrective action at LANSCE and includes issues similar to the issues identified by the Office of Oversight team on this review.

During this Office of Oversight review, LANSCE senior management closely tracked issues that arose and took prompt action where appropriate. For example, when the Office of Oversight found that special electrical work permits (SEWPs) were not being correctly applied, LANSCE Group 5 management took prompt action, including suspension of all activities falling under those permits until corrective actions could be taken.

LANSCE line management has established effective mechanisms to communicate expectations for safety through various means:

- The LANSCE division plan sets forth the LANSCE ES&H vision statement ("Worker safety, protection of the public, and respect for the environment are integral to all work at LANSCE"), the guiding principles and core functions of ISM, and the key elements of ISM derived from DOE Policy 450.4.

- The LANSCE Division Director has developed the "LANSCE Organizational Performance Objectives for the 2000 Appraisal Process," which include safety-related objectives such as improving safety performance, incorporating ISM into programmatic activities, and implementing facility work control and SWPs. The objectives have been incorporated into division and group management as well as group employee performance expectations for the current year, and are an appropriate mechanism for holding the division management accountable for safety performance and plan implementation.

- LANSCE has established several forums and committees to communicate safety expectations. These include the Group Leadership Council, the Division Office Council, the Technical Area (TA) -53 Radiation Safety Committee, the LANSCE Electrical Safety Committee, Division Director town meetings, group brown bags, division staff meetings, the laboratory information management meeting, the LANSCE program planning meeting, and the daily operations meeting, as well as scheduling, maintenance, and other meetings.

Although management has been involved and proactive and much progress has been made, much work remains to be accomplished, including the numerous tasks identified in the LANSCE ISM improvement plan. Continued management attention and leadership will be required to address this workload and achieve continuous improvement.

Workers were actively involved in safety committees and prioritization of worker-identified safety concerns.

Worker Involvement and Communication. LANSCE line management fully recognizes that active participation by supervisors and workers is essential to maintaining and improving protection of the workers, the public, and the environment. LANSCE line management has promoted an employee concerns program and established an employee safety team as a mechanism for employees to provide feedback on issues submitted for consideration; suggestions, issues, and concerns impacting safety; and actions needed to be taken to improve safety and/or awareness of safety issues. Worker empowerment continues to be excellent. The workers who were interviewed clearly understand their right to refuse to perform any work that could harm themselves, the public, or the environment. Workers also were actively involved in safety committees and prioritization of worker-identified safety concerns. For example, during the stand-down supervisors were required to meet with workers to discuss and resolve issues related to workers' rights and responsibilities for safety. Group leaders were directed to provide workers with an opportunity to identify, either directly or anonymously, any concerns about the safety of work practices or the work environment. Supervisors were asked to pay particular attention to eliciting information and opinions about potential systemic causes that might underlie the recent increased frequency of reportable occurrences or any other accidents or near misses. All LANSCE worker safety concerns were ranked by group-level management in consultation with employees and forwarded to the LANSCE Deputy Division Director for categorization and follow-up.

Although LANSCE has numerous mechanisms for communicating safety expectations to workers, increased LANSCE management attention is required to ensure that expectations for safety are fully accepted at the worker level and are appropriately applied to all work activities. Recent events (e.g., two personnel contamination events during the period of the Office of Oversight review) indicate a continued weakness with regard to SWP implementation and formality of operations. In addition, although improved over past performance, some deficiencies in the implementation of electrical safety program requirements persist (e.g., failure to properly complete SEWPs as required), and previously corrected issues, such as those identified during the 1998 EH review involving placards on forklifts, have recurred. As another example, after nearly two years, deficiencies identified in the LANL stop-work institutional Laboratory Implementing Requirement have not been adequately addressed. Such weaknesses are discussed and analyzed in more detail in Section 2.2.

LANSCE has ongoing efforts designed to strengthen communication to workers and improve individual safety performance.

LANSCE management recognizes that weaknesses in implementation of requirements warrant continued attention. Several of the LANSCE ISM improvement plan provisions are designed to further strengthen communication to workers and improve individual safety performance. In combination with the existing mechanisms (e.g., safety committees and performance evaluations), the actions identified in the LANSCE ISM improvement plan are appropriate. Although continued attention is needed, the results of this review indicate a positive trend in worker adherence to procedures. The continued and consistent use of existing and planned mechanisms should result in continued improvement in safety management performance.

Although generally well-designed, the planned actions could be strengthened by placing more emphasis on efforts to ensure that senior management expectations are clearly and consistently communicated through all layers of management down to the worker level. Particular attention is needed to ensure that senior management expectations reach the worker at the activity level and that group leaders (who have first-line management responsibility for completing tasks) and research projects do not send conflicting or ambiguous messages about the importance of safety. For example, lessons learned from the stand-down

indicated that management needs to clearly communicate the importance of safety over operational/production needs. At a recent event critique, there were indications that management needs to continue to emphasize this point. Mechanisms to ensure that management expectations are clearly communicated to and understood at the working level need to be further strengthened. For example, as part of the current management walk-around program, LANSCE managers need to more explicitly emphasize and reinforce management's expectations for safety directly with the workers.

Planning and Resource Allocation. Historically, ES&H planning and resource allocation processes at LANSCE have largely relied on historical experience and the judgment and experience of individual line managers. While current ES&H resources are generally adequate to perform work safely, there are a few instances where ES&H staffing limitations are impacting the ability to provide needed levels of ES&H support to operational activities. For example, as discussed in Section 2.2, staffing shortages have precluded industrial hygiene personnel from regularly participating in facility tours and management walk-throughs.

The LANSCE ISM improvement plan identifies numerous important safety-related actions that need to be accomplished.

In addition, the LANSCE ISM improvement plan and other LANSCE documents (e.g., FSP and the issues list from the safety stand-down) identify numerous important safety-related actions that need to be accomplished, such as developing and gaining approval for safety documentation and ensuring that the FSP and its subordinate documents are developed and sufficient to identify operating limits as required by LANL institutional requirements. Many of the identified actions are complex, interrelated, and difficult; within the available resources, they cannot all be implemented simultaneously, so priorities must be established. The LANSCE ISM improvement plan identifies responsibilities and milestones for most actions and is a good first step. The milestones were developed by multiple teams that did not have the benefit of a formal and rigorous planning and prioritization process identifying the specific actions and specific resources needed to complete the tasks.

LANSCE management recognizes the need to take a more rigorous approach to planning and to develop and apply tools for prioritizing and allocating resources to meet ES&H requirements. LANSCE is now taking steps to initiate a strategic approach to planning division activities and developing the tools to more effectively manage its operations and resources. LANSCE has committed to develop a new strategic plan for the division early in CY 2000 and has begun development of a strategic plan for infrastructure at TA-53, which is an important first step in addressing the aging facility infrastructure and associated programmatic concerns at TA-53. In addition, LANSCE senior management, group leaders, and facility management participated in an offsite retreat to plan the spring 2000 outage at LANSCE during which facility and programmatic maintenance, utility upgrades, and equipment installation will be performed. One of the key results from the retreat will be a resource-loaded outage schedule that will take into account and make more efficient use of the limited ES&H and other resources within the division.

LANSCE senior management plans to develop a division-level strategic tool for allocating resources and scheduling activities.

As part of the planning effort for the upcoming outage, LANSCE senior management expects to develop a division-level strategic tool for allocating resources and scheduling activities that will be integral to the development of a revised division strategic plan. The development of such a management tool/system has the potential to help line management to use limited ES&H resources more efficiently. The development of such a tool/system, however, poses significant challenges that LANSCE needs to address if the effort is to be successful. For example, such systems require a detailed analysis of activities needed to accomplish each task and a carefully designed process for prioritizing risk based on multiple factors (e.g., risk, safety, funding constraints, and personnel availability). LANCSE needs to ensure that any such tool/systems are carefully coordinated with institutional processes that support requirements identification and flowdown and support for authorization basis documentation preparation.

Summary

LANSCE has made progress since the 1998 review and has ongoing efforts to further improve ES&H systems and fully implement ISM. LANSCE management is involved with and supportive of safety, as evidenced by actions such as a safety stand-down and development of an approved FSP. LANSCE has taken appropriate actions to increase worker involvement in safety. Improvement in worker implementation of safety responsibilities is evident. LANSCE management is committed to implementation of ISM and has demonstrated a proactive approach to identifying and addressing weaknesses. Within the available resources, LANSCE has appropriately identified needed improvements and developed a plan to address them.

Management has been involved and is responsive to safety issues and concerns. Although progress has been made, much work remains to be accomplished. Continued management attention and leadership will be needed to ensure that ongoing and planned actions identified in the LANSCE ISM improvement plan are fully implemented and achieve their objectives. To this end, particular emphasis needs to be placed on implementing better processes and tools for allocating resources and strengthening mechanisms to ensure that workers understand and implement their safety responsibilities.

Clear Roles, Responsibilities, and Authorities

Organizations that have effective safety management programs place responsibility, authority, and accountability for safety with line managers. Accordingly, line management must ensure that the program includes well-defined roles, responsibilities, and processes for ensuring that management is accountable for safety performance.

At the institutional level, the LANL ISM description document (LAUR-98-2837, Rev. 3) provides the basis for clear, unambiguous roles and lines of responsibility, authority, and accountability, consistent with the expectations for an ISM system. As part of the LANL ISM system, Laboratory Performance Requirements (LPRs), Laboratory Implementing Requirements (LIRs), and Laboratory Implementing Guidance (LIGs) are used to establish the requirements and guidance for development of the FSP and facility-tenant agreements (FTAs). Various LIRs (LIR 250-02-02.6, "Facility-Tenant Agreements," and LIR 280-02-01.0, "Laboratory Facility Management Program") describe the roles, responsibilities, and authorities of the Facility Manager (FM) and the group/line organization for completing FTAs, carrying out key activities such as developing and communicating facility and group operating limits, and defining certain processes essential to the Facility Management Program, such as change control processes for changes to operating limits. LPR 240-01-00.2, "Facility and Operating Limits and Configuration," provides a broad set of LANL requirements for the preparation of FSPs that describe the roles, responsibilities, and authorities of positions, committees, and teams that are responsible for carrying out key safety management responsibilities.

LANSCE has broadly defined safety management roles, responsibilities, and authorities in the FSP and division FTAs.

At LANSCE, safety management roles, responsibilities, and authorities are delineated in the LANSCE FSP and division FTAs. While the FSP and FTAs are still evolving and continue to have some weaknesses, the development of these documents is a positive step toward addressing weaknesses in roles and responsibilities identified on previous Office of Oversight appraisals, including the 1998 review. The FSP contains a description of the LANSCE safety management organization and the broad responsibilities of line management. The division FTAs reflect institutional requirements and broadly define the roles, responsibilities, and authorities of the LANSCE FM and tenants (groups). In addition, the FSP includes a brief description of the roles of safety committees and teams, as forums for resolving ES&H issues and advising line management on safety implementation strategies (see Figure 2 on page 13).

LANSCE has met its schedule commitments for developing the FSP (originally approved in December 1998) and has completed the first annual revision on schedule (revised in September 1999). During the revision process, the FSP was improved by adding detail and clarifying various provisions based on feedback and operating experience. For example, the annual revision of the FSP was improved by defining the roles, responsibilities, and authorities of the Experimental Area Manager (EAM) and the person responsible for experimental instruments; these functions enhance

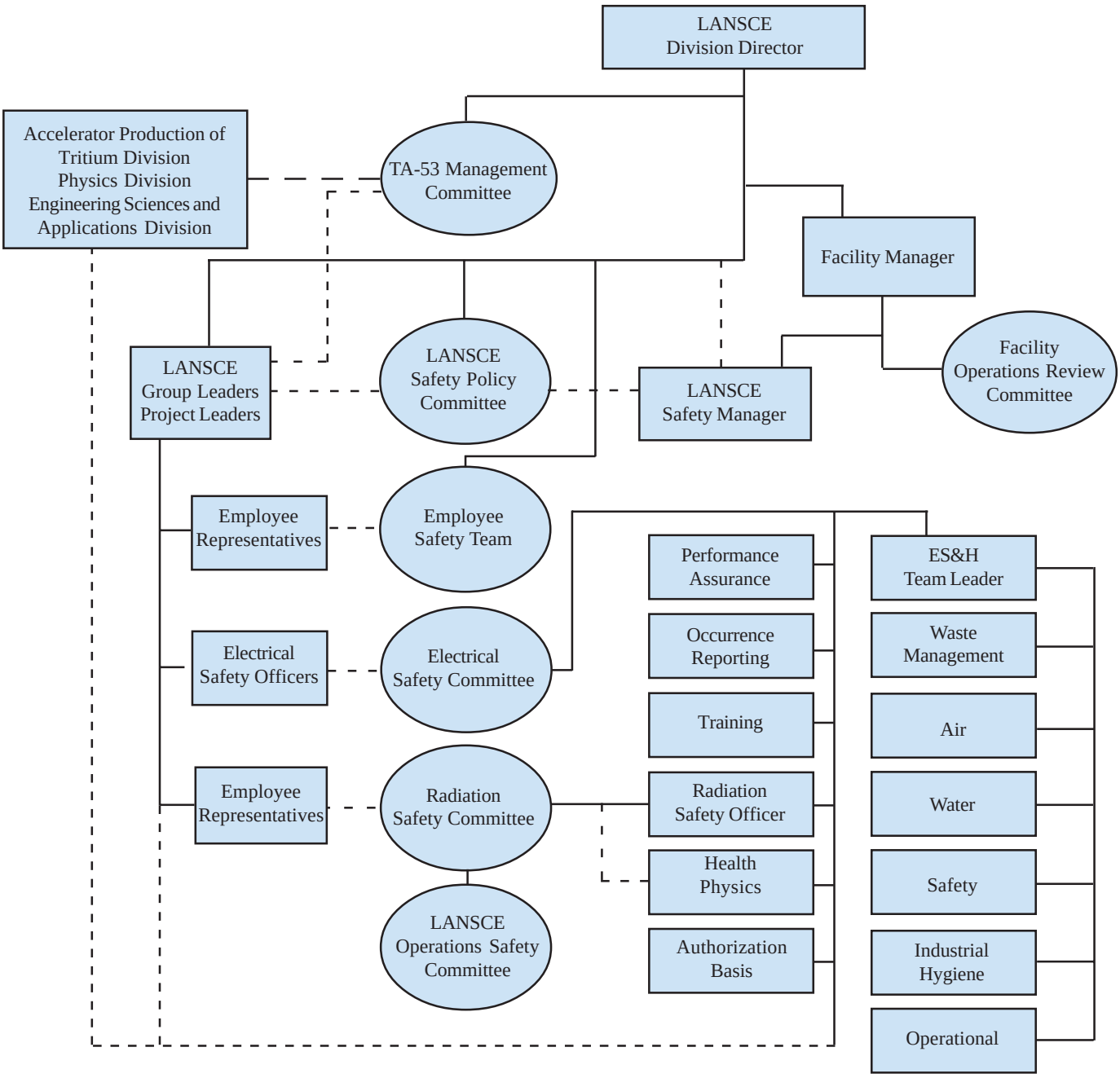


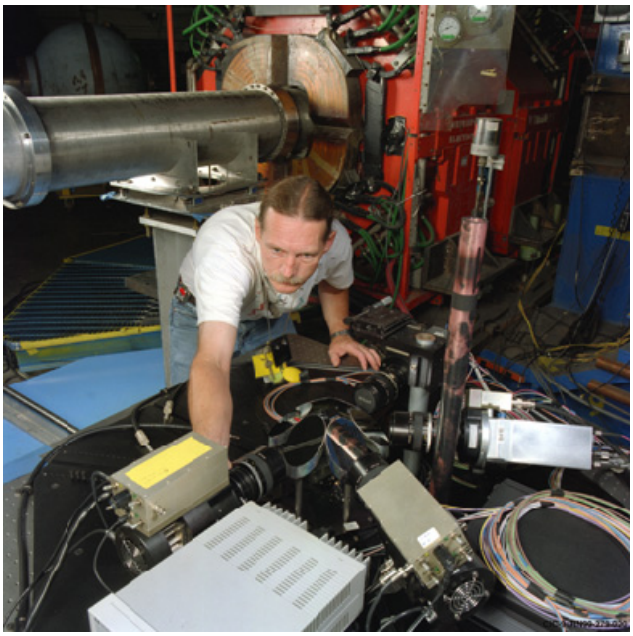
Figure 2. LANSCE Safety Management Organization

safety management by coordinating experimental activities within a building.

LANSCE recognizes that the FSP and supporting documents need to evolve and improve.

Although the FSP and FTAs are a step forward, LANSCE recognizes that these documents need to evolve and improve and that some aspects of the defined roles and responsibilities have not yet been fully implemented. For example, certain positions (e.g., performance assurance coordinator and industrial hygienist) are not yet staffed, and aspects of some safety committees are not fully functional and formalized. The FSP and FTAs sometimes reference documents and information that have not yet been developed and approved, such as safety analysis documents (SADs) and the ten-pound limit on explosives in LANSCE Area C. LANSCE has efforts under way to address these recognized shortfalls and has initiated efforts to improve tenant agreements through a facility management tenant team, chaired by the LANSCE FM. This team has improved tenant agreements by including a more clear delineation of services to be provided by the FM and further detailing tenant responsibilities. The facility management tenant team also concluded there was a need to develop additional subordinate documents to implement many of the roles, responsibilities, and authorities now described in current tenant agreements. The creation of subordinate documents will be an ongoing effort over the next year.

In most cases, the roles and responsibilities were being implemented as described in the FSP and FTAs during work activities observed by the Office of Oversight team. However, the Office of Oversight team observed several instances where roles, responsibilities, and authorities were not being effectively carried out. The role of the approving individual for SEWPs was not being properly carried out when permits were approved without all of the necessary signatures. In addition, many group leaders did not display a clear understanding of their responsibilities for carrying out chemical inventory requirements. A documented method for the independent review of experiments has been established within the experimental review process, but responsibilities for independent review were not adequately defined in some cases.



Researcher setup of a proton radiographic experiment in Area C

In addition to efforts on the FSP and the FTAs, LANSCE management has been proactive in defining additional roles and responsibilities to address identified weaknesses in facilities where experimental activities are conducted. For example, the creation of the EAM in Area C in 1999 helped to improve coordination of experimental activities and ensure that experiments are conducted within the Area C safety envelope and operating limits. A memorandum of understanding among the LANSCE Group 7 (i.e., the high-intensity beam lines, experimental areas, and remote handling group), the experimental groups, the FM, and the EAM further defines and clarifies the safety roles and responsibilities of all involved groups.

LANSCE also took proactive steps to address potential concerns identified on this Office of Oversight review involving coordination of group activities within multi-tenant facilities. Specifically, LANSCE management, foreseeing the need to improve coordination among tenant groups, accelerated its plans to establish a lead tenant role. LANSCE developed a draft document describing the responsibilities of the lead tenant and has begun to implement the concept. Although the position is still evolving, LANSCE appointed lead tenants and lead tenant designees for six Meson Physics Facility (MPF) buildings (the term "MPF" is used to identify specific buildings, such as MPF-7, in the LANSCE complex). Large status boards have been posted, identifying building tenants, work activities, and hazards in each building. As the roles

and responsibilities evolve, the lead tenant position has the potential to improve safety by ensuring that all group activities in a building are coordinated and are conducted within approved operating limits.

Although positive steps, the effectiveness of the EAM and lead tenant positions needs to be further strengthened.

Although positive steps, the effectiveness of both the EAM and lead tenant designee needs to be further strengthened by empowering personnel in these positions with the authority to resolve issues related to maintaining the safety envelope and coordinating issues among tenant groups. In addition, the EAM position does not yet have a mechanism (e.g., a checklist) for confirming that planned experimental activities will be conducted within the building or area safety envelope. Such a mechanism is needed to provide a greater level of assurance that all important information, such as experimental parameters, operating limits, and facility readiness, is confirmed before experimental work is authorized. The development of building safety envelopes and building emergency plans is also needed to aid the lead tenant and EAM in identifying and exercising their roles and responsibilities.

Summary

The FSP, FTAs, and other LANSCE documents have improved the clarity of roles, responsibilities, and authorities at LANSCE. When fully implemented, the FSPs and FTAs describe a safety management organization that is consistent with the LANL institutional requirements for an ISM system. Also, LANSCE has been actively working to revise and improve the FSP and FTAs and enhance safety through clarification of roles and responsibilities, including establishment of the EAM and lead tenant functions.

Although an accomplishment, the FSP and FTAs need continued refinement and improvement to ensure that operational limits are defined and adhered to. Development of the subordinate documents (e.g., building safety envelopes) that specifically define how responsibilities will be implemented is an important step that needs to be accomplished. Timely implementation of ongoing activities, such as development of the SADs referenced in the FSPs and staffing of certain positions (authorization basis specialist, performance assurance coordinator, and industrial hygienist), is another important step that needs to be accomplished. Also, additional communication and/or training are needed to ensure that roles and responsibilities are understood and implemented as required.

While much work remains, LANSCE has a good understanding of current weaknesses and has efforts in place to make the needed improvements. With continued evolution and refinement of the FSP and FTAs and development of subordinate and supporting documents, LANSCE is well positioned to establish a set of roles, responsibilities, and authorities that is consistent with the requirements of ISM.

Identification and Flowdown of Requirements

An effective safety management system must include processes to identify, communicate, execute, and monitor all applicable DOE requirements and Federal, state, and local regulations. In addition, processes that provide change control and maintenance mechanisms for a given set of baseline requirements must be in place. Translating these requirements into policies, programs, and procedures; tailoring them to specific work activities; and effectively implementing them so as to protect workers, the public, and the environment are a necessary and integral part of an effective safety management system.

Institutional-Level Processes for Identification and Flowdown of Requirements. At the institutional level, the LANL standards and requirements system provides a sound basis for the identification and flowdown of requirements governing the safe performance of work at the laboratory. This system is described in the LANL ISM description document, LAUR-98-2837, Rev. 3, and is based on the identification of a set of Work Smart standards that include all applicable laws, regulations, a number of DOE directives, and industry standards that have been incorporated into Appendix G of the University of California-DOE contract. From these standards and requirements, LPRs and LIRs are created as the mechanism for flowdown of requirements to the division, and ultimately to the work activity level. LIR 301-00-01.9, "Issuing and Managing Laboratory Operations Implementation Requirements and Guidance," and LIR 301-00-00.0, "Managing Change

Control of Laboratory Operations Standards and Requirements," are in place and effectively provide for the issuance, management, and change control of institutional requirements.

The institutional process for flowdown provides the necessary mechanism for dissemination of requirements, but the rate at which requirements are developed or revised has created a burden at the division level.

The institutional process for flowdown provides the necessary mechanism for dissemination of requirements to the LANSCE division. However, the rate at which new or revised LPRs and LIRs are being generated at the institutional level—26 in 1998, 54 in 1999, and approximately 16 anticipated in 2000 as part of the laboratory ISM milestone commitment to DOE—has created a burden at the division level. This situation is exacerbated in some instances by the lack of guidance to divisions/groups regarding implementation or the need for additional training when an LIR has been issued or revised.

Training at the institutional level has been provided in many areas, such as SWPs and radiation protection, to assist divisions in the implementation of requirements. However, provisions for review of new or revised requirements to identify training requirements need to be strengthened. Although some safety committees, such as the Electrical Safety Committee, review new requirements and provide revisions to training programs, there is no formalized process in place that requires review of all new requirements to determine what, if any, training may be needed to support implementation. An issue related to incorporating training into requirements implementation was identified by the Office of Oversight accident investigation follow-up review team in 1998.

The need for additional training and/or guidance is highlighted by difficulties experienced at LANSCE when preparing to implement DOE Order 5480.19, *Conduct of Operations*, as required by LPR 240-01-00.2, "Facility and Operating Limits and Configuration." Although a crosswalk between DOE Order 5480.19 and the LPR had been prepared as part of the FSP LIG process (LIG 240-01-10.1), the guidance did not provide sufficient information on how to integrate the elements of conduct of operations within the LANSCE FSP. In this instance, additional guidance in the form of a crosswalk between the elements of conduct of operations and the guiding principles and core functions of ISM would have been helpful in preparing the FSP.

LANSCE has experienced difficulties in the effective flowdown of requirements from the institutional level to the working level.

LANSCE Implementation of Dissemination and Flowdown of Requirements. LANSCE has not established a sufficiently formal system for the dissemination of requirements. In the absence of such a formal system, LANSCE has experienced difficulties in the effective flowdown of requirements from the institutional level to the working level. LANSCE management is aware of this weaknesses and has identified it as an issue in the "TA-53 LANSCE Planning for ISM Improvement Plan," revised October 15, 1999. To be most effective, a formal system needs to incorporate implementing guidance and identify training needs. The effective flowdown of requirements is also hindered by other factors, including constrained ES&H resources, the high rate at which LIRs are being promulgated during LANL's implementation of ISM, and lack of sufficient ES&H subject matter involvement in interpreting LANL institutional requirements.

Currently, the facility managers and group leaders have primary responsibility for determining how requirements are disseminated. Without formal guidance, performance of this function has varied considerably across LANCSE. The Maintenance and Operations organization within the LANSCE facility management group (LANSCE-FM) took an innovative approach and directly linked its facility work control process to the institutional requirement (LIR 230-03-01.5) by developing a flow diagram organized into groupings that reference specific sections of the LIR. The potential for other LANSCE organizations to apply this innovative approach, or to adopt a similar approach on an LANSCE-wide basis, needs to be explored. In other organizations, however, the lack of a formal system to disseminate requirements has resulted in situations where new or revised requirements were not communicated to all affected groups. For example, the LANSCE Group 7 office was not notified of the new LIR for forklift training.

The flowdown of requirements has not been fully effective in several ES&H areas.

The flowdown of requirements to the activity level has not been effective in several ES&H areas. For example, baseline surveys of all work areas and operations are not documented to verify that work spaces have been evaluated for potential worker health risks as required by DOE Order 440.1. In addition, there were deficiencies with SEWPs in LANSCE Group 5 that resulted from improper flowdown of requirements where the applicable LIR had been changed. The change was not identified and reflected on the LANSCE Group 5 Web page. In addition, when LANL changes institutional requirements on the Web, there is no process for assuring that corresponding changes are made on lower tier division-level Web pages.

Some Work Smart standards are not incorporated into LANSCE procedures or practices. For example, U.S. Occupational Safety and Health Administration (OSHA) 29 CFR 1910 is adopted in Work Smart standards. OSHA 29 CFR 1910.132 identifies specific requirements for how certain hazards assessments are to be documented and how workers are to be trained; however, these requirements were not supported in any documented workplace hazards assessment. LANSCE building emergency plans do not appear to be consistent with the emergency plan requirements of OSHA 29 CFR 1910.38.

LIR 402-870-1.0, "Ergonomics," requires job-specific training for employees whose jobs or workplaces have identified ergonomic risk factors, but a requirement for ergonomic training was not identified on some LANSCE training matrices. Office ergonomic training requirements are identified during employee orientation; however, supervisors lack training in identifying ergonomic hazards in experimental areas.

In addition, a procedure for conducting critiques had not been developed per DOE Order 232.1. Although there is a TA-53 standard for the determination of unreviewed safety issues, the standard has not been fully implemented. Currently, there is no performance assurance function in place at LANSCE to verify the effectiveness of requirements flowdown to the activity level.

ISSUE: LANSCE does not have a sufficiently formal process for dissemination of requirements that ensures that all new and modified requirements effectively flow down to the work activity level and are reviewed to determine training and guidance needed to support implementation, in accordance with LIR 301-00-01.9, "Issuing and Managing Laboratory Operations Implementation Requirements and Guidance." The effective flowdown of requirements has also been hindered by other institutional factors, including the high rate at which institutional requirements have been promulgated, the lack of sufficient ES&H subject matter expert involvement, and lack of sufficient institutional guidance in some cases.

Flowdown of requirements through the FSP and FTA. LANSCE has made substantial progress in meeting the requirements of the Special Assessment Clause 5.14 of the ISM description document. This has been achieved through the development, completion, and implementation of the LANSCE FSP. However, the FSP does not fully meet the intent of the LPR 240-01-00.2, "Facility and Operating Limits and Configuration," which governs FSPs. Specifically, the FSP does not provide specific safety envelope and operating limit information that can be directly applied to some buildings and operations, and does not incorporate analyses of hazards or references to specific subordinate documents that would envelope research and multiple experimental activities within some buildings.

LANL has recently promulgated an LIR for non-nuclear facility safety authorization.

One of the FSP deficiencies related to specific safety envelope and operating limit information identified by the Oversight team can be attributed to the need for an institutional requirement that drives the development and approval of documents governing the authorization, aggregate hazard analysis, restart, demonstration of readiness, or change control for non-nuclear, low-hazard facilities. LANL has recognized this weakness and recently promulgated an LIR for non-nuclear facility safety authorization, which provides

requirements, commensurate with potential consequences of hazards, for establishing the authorization basis of non-nuclear hazard category facilities.

In lieu of an approved LIR and the acknowledgement of the need to expand the TA-53 FSP and FTAs to capture aggregate hazards, LANSCE created the EAM and lead tenant functions and applied the Independent Verification Panel (IVP) review process to some non-nuclear facilities.

The LANSCE FTAs do not include all needed information to establish operating limits.

The LANSCE FSP references FTAs as the primary means for establishing mutual expectations between facility management and tenant groups within buildings and for communicating safety envelope and operating limit information to tenants. However, the FTAs often do not include such information. Memoranda of understanding and other subordinate documents for defining safety envelopes and operating limits have not been completed, except in one case (Area C). The generic hazards specified in the FSP have not been incorporated in FTAs. The need to integrate these documents and to develop and implement the necessary subordinate documents to fully implement FTAs is a management challenge that has been identified in the "TA-53 LANSCE Planning for ISM Improvement Plan."

Although LANSCE management is making progress in improving their FTAs (discussed under Clear Roles, Responsibilities, and Authorities), some aspects of FTAs do not meet applicable requirements (e.g., LIR 250-02-02.6, "Facility-Tenant Agreements," and LIR 280-02-01.0, "Laboratory Facility Management Program"). For example, the FTA does not specifically define group or facility operating limits, nor does it reference or attach pertinent documents where those limits are described. The FTA LIR assigns the FM the responsibility for periodically reviewing and monitoring group activities to ensure that they are conducted within established operating agreements. Except for some management walk-arounds conducted by facility management, there is no documented process in place for periodically reviewing group operations, such as group-level self-assessments. LIR 280-02-01.0 assigns the responsibility for establishing and communicating group and facility operating limits to affected line organizations in the Facility Management Unit to both the tenant/group line manager and the FM. During this Oversight review there were instances where group personnel, below the group leader level, did not display an accurate knowledge of operating limits, and in one case, a group leader was not aware of the distinction between group and facility operating limits.

The requirements for defining and documenting the methodology for determining the cost of services, including ES&H services, is assigned to facility management. However, that role has not been implemented through an established, well-defined prioritization, allocation, or approval process. LANSCE senior management has recognized this as a weakness and is instituting an External Review Committee with representatives from other DOE locations and industry to formally review the LANSCE-FM budgetary prioritization and allocation process and make recommendations to strengthen the overall process.

ISSUE: The LANSCE FSP and associated FTAs do not fully meet the intent of applicable LANL requirements, including requirements for identifying safety envelopes and operating limit information, and analyzing aggregate hazards between and within multi-tenant buildings.

Authorization Basis Documents. LANSCE has made some progress in the development, review, and approval of authorization basis documentation for high- and medium-hazard facilities. For example, LANSCE is in the process of developing a basis for interim operations (BIO) for the Lujan 1L Target.

Most LANSCE facilities do not currently have approved authorization basis documents for low- and medium-hazard operations.

However, other than the Low-Energy Demonstration Accelerator (LEDA), which has an approved SAD, LANSCE facilities do not currently have approved authorization basis documents for most LANSCE low- and medium-hazard operations. Some buildings may or may not require a safety envelope authorization basis document but could require a safety envelope. DOE recently upgraded the 1L Target at the Lujan Center to a Category 3 non-reactor nuclear facility, which requires a safety analysis report.

However, the schedule for safety analysis report development and approval has not been established. Further, the authorization basis, readiness process, and change control process have not been established for low-hazard, non-nuclear facilities. A particular concern is the apparent disconnect between LANL and AL/LAAO on the timing of authorization basis document reviews. LANL has raised the priority for completing certain SADs and has established milestones for finalizing them. However, there are indications that AL/LAAO will be unable to review and approve authorization basis documents in a timely manner because of the extensive backlog of safety documents, some of which are higher priority than the SADs that LANSCE plans to submit. In the absence of approved authorization basis and/or safety analysis documents, LANSCE cannot fully evaluate the safety envelope for experiments or work activities within many buildings.

ISSUE: LAAO, LANL, and LANSCE have not effectively managed the review, development, and approval process for authorization basis documents in a timely manner, in accordance with applicable DOE requirements and standards.

The lack of an approved authorization basis for many LANSCE operations is a concern. While some improvements have been noted, the issues associated with timely development and review of authorization basis documentation was previously identified in the 1996 EH safety management evaluation and is currently being tracked as a legacy issue in accordance with Defense Nuclear Facilities Safety Board Recommendation 98-1. The status of authorization basis documentation is a focal area of the DOE ISM verification review team, which is performing a broad review of the authorization basis process for all LANL facilities. Consequently, the Oversight findings related to LANSCE authorization basis documents have been communicated to the DOE ISM verification review team for their consideration in the broader context of their assessment.

Summary

LANL institutional-level processes are effective in identifying and disseminating new and modified requirements. However, LANL needs to place more emphasis on providing implementing guidance and reviewing the need for training to facilitate the implementation of new and modified requirements by LANSCE and other LANL divisions.

At the LANSCE level, the lack of a sufficiently formal process for dissemination of requirements hinders effective flowdown and implementation of requirements. While LANSCE management is aware of these weaknesses and has identified them as an issue in the LANSCE ISM improvement plan, LANSCE management needs to strengthen the process for flowdown and implementation of requirements at the activity level. A formal process for dissemination of new or revised requirements within the division needs to be developed to identify the key aspects of a new or revised requirement that is critical to implementation. Management also needs to have a formal process for developing subordinate documents or procedures to effect implementation, and any training that may be required to ensure effective implementation. In addition, a performance assurance mechanism is needed to verify the status and effectiveness of requirements flowdown and implementation at the activity level.

2.2 Evaluation of the Core Functions

DOE Policy 450.4, "Safety Management System Policy," defines the five core safety management functions that provide the necessary structure for any work activity that could affect the safety and health of the public, the workers, or the environment. The functions are applied as a continuous cycle, as shown in Figure 3, to systematically integrate safety into the management of work practices at the institutional, facility, project, and activity level. This review focused on work being performed at LANSCE. A range of R&D activities was examined at this facility.

The following sections summarize LANL's performance with respect to the five core functions.

Define the Scope of Work

Core Function #1: Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

A well-defined scope of work is critical to the success of an ISM system. It is the foundation of the budget formulation and allocation process and sets the stage for the rigor and depth of work-related hazard identification and analysis. An effective ISM process involves formal processes to ensure that work is accomplished according to expectations and incorporates multidisciplinary teams, up-front

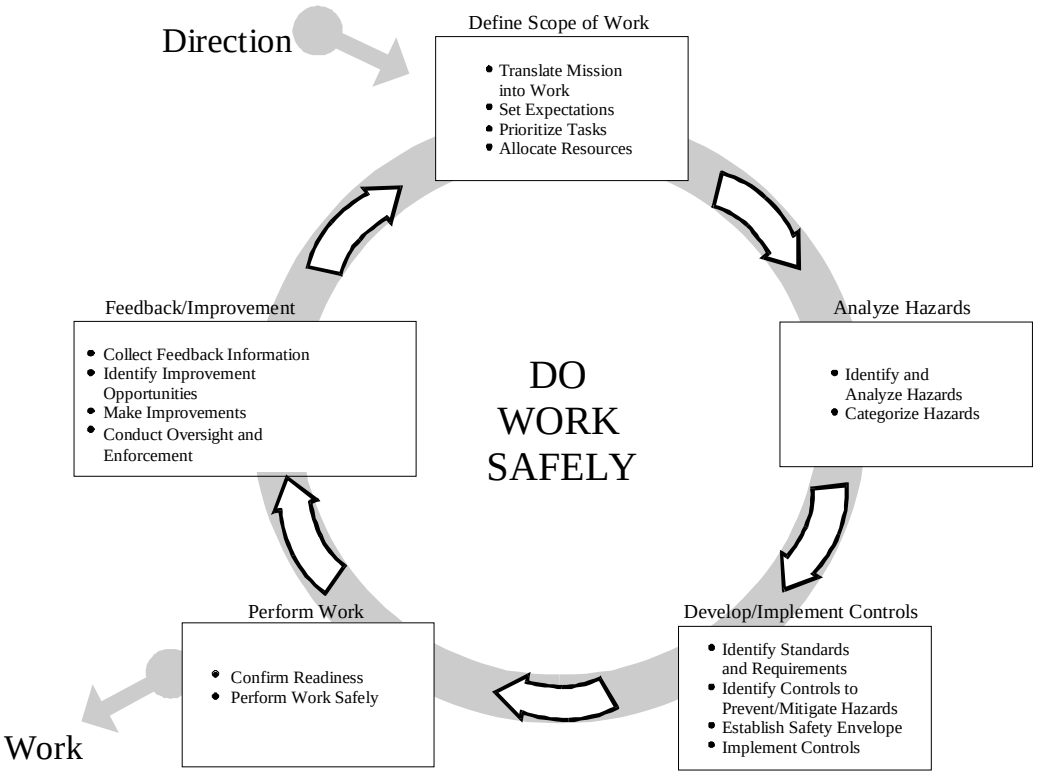


Figure 3. Core Functions of Integrated Safety Management

hazard analysis, and the development of controls to enhance the effectiveness of these processes.

There have been improvements in defining the scope and limitations of research and experimental work activities at LANSCE in the past two years.

There have been improvements in defining the scope and limitations of research and experimental work activities at LANSCE since the Oversight follow-up evaluation in January 1998. The improvements include better definition and documentation of work throughout all LANSCE groups. All groups have implemented the SWP LIR procedure, prepared work inventories, developed hazard control plans (HCPs) that define the work for specific tasks, and improved accountability and documentation for authorizing work activities that present hazards.

Some LANSCE groups, such as LANSCE 2, have identified and documented institutional requirements on their work inventories for work activities that are not covered by HCPs. This additional documentation is considered a good practice because it further integrates institutional requirements into work activities that are not covered by an HCP. With this practice, institutional requirements are explicitly identified for those activities.

Based on walk-downs and observation of work in several LANSCE facilities, the work inventories accurately reflected the extent of work performed in those facilities. Work inventories generally described the nature of the work, the location, HCPs required for the work, most knowledgeable person, authorizing person, date authorized, and due dates for the next review of the HCP. The addition of the work inventories, required by the SWP LIR 300-00-02.1, is an improvement in defining the scope of research-related work activities.

For experiments that use the beam from the LANSCE accelerator, requirements for work definition are contained in LANSCE Facility Implementing Requirement (FIR), 53 FIR 300-00-01.0, "Technical and Safety Review of User Experiments at LANSCE." This procedure prescribes the additional requirements for users (external and internal) to submit proposals (definition of work) for screening and review. The experiments related to beam activities selected for Oversight review were adequately defined. To

consolidate and facilitate use of LANSCE facilities by outside users, LANSCE established a "users' office" as a single point of contact for all outside users. This user interface is well established through this users' office and a clearly designed Internet Web page that references LANSCE capabilities, LANL and LANSCE requirements, training requirements, points of contact, and logistics information for the laboratory.

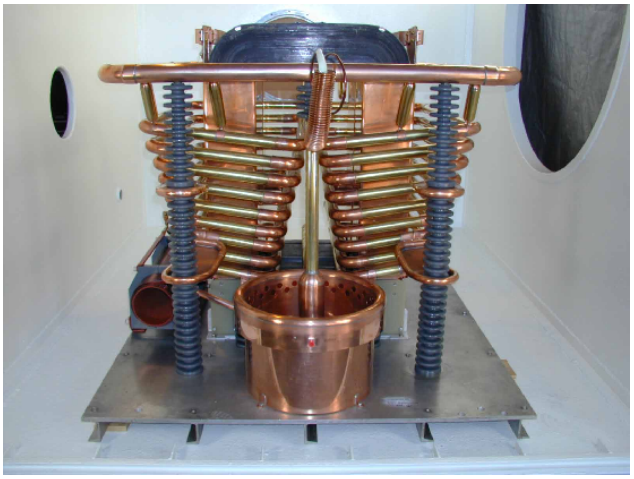
LANL SWPs were implemented relatively recently and are evolving.

The LANL SWP LIR and documentation of SWP LIR procedures were implemented relatively recently and are evolving as LANL groups gain experience with implementing the requirements across a wide range of diverse work activities in numerous facilities. Some deficiencies were identified in several work inventories, such as: the locations of some work activities were not specific, the name of the authorizing person was not always listed as required, authorization dates were listed on some inventories, and review dates for HCPs were not listed on some inventories. During the Office of Oversight review, LANSCE management and group leaders took prompt action to revise the work inventories. The revised work inventories were improved, but some still require more specificity about the location of the work to ensure that hazards associated with a specific work location or work environment are identified.

For beam-related experiments, LANSCE has an adequate experimental review process to define work associated with a given experiment. The process includes evaluating the initial proposal; approving the concept; reviewing the material, setup, operation, and teardown; and training all users. This process includes requirements to document changes in defined work and new work associated with the same experiment.

In the absence of a documented work breakdown for some experiments, some work steps were not defined in enough detail to perform adequate hazard analysis.

For non-beam-related experiments, LANSCE does not have an experimental review procedure that ensures a documented analysis of all experimental work. The draft SWP guidance document, when issued, will provide additional direction via the ES&H identification (ES&H-ID) process. The lack of an experimental review procedure for non-beam experiments and modifications increases the potential for omissions or inadequate work definition. For example, during the BANSHEE MV Pulse Transformer upgrade project, work sequences and work steps for project line items for experimental setups were not well documented. Although some operations are addressed by HCPs, others are not. In the absence of a documented work breakdown for many line activities on the project schedule, it was not clear that work steps were defined in enough detail to perform adequate hazard analysis.



Several of the main components for the BANSHEE experiment upgrade project

With the implementation of SWPs, HCPs were written to further define the scope of work and identify work steps that may present additional hazards. Many of the previously existing standard operating procedures were revised and converted to HCPs. The HCPs are an improvement over the previous standard operating procedures and provide better definitions of work, facilitating analysis and control of hazards. However, some HCPs do not define work activities associated with setup and support of research equipment, maintenance, and dismantling of experiments when they are completed. Consequently, some work activities may not be performed within the envelope of the LANSCE-FM or SWP work control processes.

An SWP LIG was issued in September 1999 to improve consistency of implementation.

LANSCE recognizes and has documented some of the issues associated with effective definition and

documentation of work activities. An SWP LIG was issued in September 1999 to improve consistency of implementation by providing checklist systems and an ES&H-ID system (discussed further under Core Function #2, Analyze Hazards). This LIG should improve documentation of the work definition process.

Summary

There has been improvement in the LANSCE processes for defining and documenting the scope of work activities to ensure that potential hazards can be analyzed and controlled. Work inventories have been established to document each LANSCE group's work activities and, in combination with authorization requirements, serve to limit the scope of work to documented activities. The efforts, some of which were recently implemented, are continuing to evolve. Continued improvement in the consistency of implementation is expected as LANSCE groups gain experience with methods for implementing requirements and guidance. Implementation of the SWP LIG is a positive step toward standardizing the approach for defining and documenting work activities. Additional program improvements and consistency in work practices for similar hazards could be achieved by defining and documenting all work activities (beam-related, non-beam-related, and facility management work) in the same manner.

Analyze Hazards

Core Function #2: Hazards associated with the work are identified, analyzed and categorized.

To conduct work safely, line management must ensure that structured processes exist and are implemented sitewide to identify and analyze work hazards consistent with the complexity of the work activity and the significance of the risks. The level of line management involvement in reviewing and approving hazard analyses should be commensurate with the complexity of the work and the hazards involved.

At LANSCE, hazard identification, analysis, and categorization programs and procedures have been established for both facility and research work. The SWP process establishes the requirements for performing hazard analysis of R&D work at the activity level. At LANSCE, three processes are used for hazard analysis—SWPs, facility work control processes, and authorization basis documents. Facility work control processes, which apply to maintenance, construction, and facility structure improvements, were evaluated during the 1998 Office of Oversight follow-up review of the accident investigation and were not evaluated during this review.

Some authorization basis documents have expired or are not finalized.

LANSCE Facility-Level Hazard Analyses. Certain activities within the scope of DOE Order 5480.23 (for nuclear activities) and DOE Order 420.2 (for accelerator activities) require an authorization basis to support DOE acceptance of risk and approval of operations in those facilities. Authorization basis documents include hazard analyses that form the basis for establishing an operational safety envelope, and subsequent engineering and administrative controls. For nuclear activities at LANSCE, hazard analyses are documented in BIO documents, which have been approved by DOE for experiments involving neutron scattering by actinides and for operation of the 1L Target in Building MPF-7. However, both BIOs have expired. The actinide BIO has been revised and resubmitted. The 1L BIO is in the comment resolution process pending resubmittal. A hazard analysis for explosive operations at LANSCE was developed. For accelerator facilities, SADs are required per DOE Order 420.2 for the LANSCE Accelerator Complex, the LEDA, the Short Pulse Accelerator, and the Advance Free Electron Laser accelerator. Of these four facilities, only the LEDA project has a SAD, which has been approved by DOE. SADs for the other three facilities are in development.

The lack of a SAD for the LANSCE Accelerator Complex creates a problem in defining safety envelopes for experimental operations. A number of LANSCE facilities require accelerator beam access. Without a LANSCE Accelerator Complex SAD, such facilities do not have a comprehensive basis for developing and defining building operational and experimental safety envelopes. Although accelerator and experiment operating limits are defined in the Linear Accelerator Operations Manual and HCPs, these limits alone are insufficient to establish building operating limits. In addition, lacking a LANSCE Accelerator Complex

SAD, some facilities (e.g., Area C) had to pursue the development of an alternative authorization basis process to document the hazard analysis and establish a basis for authorizing work, such as development of the explosive operations hazard analysis. The LIR, which provides guidance on authorization basis, was recently issued.

For some non-nuclear facilities, there is no clear process for analyzing the aggregate hazards associated with multiple activities in those facilities.

Other research experiments are conducted in facilities that are neither accelerator- or nuclear-related and that may or may not require an authorization basis. The experimental HCPs, FTAs, and the LANSCE safety plan provide some bounding constraints. However, these documents do not provide a sufficient basis for clearly defining facility or building operating safety envelopes and operating limits that are understandable and that building tenants can implement in accordance with the FTA. In addition, in the absence of an authorization basis document or a safety envelope for these facilities, there is no clear process for analyzing the aggregate hazards associated with multiple activities in those facilities that house a variety of activities. Some LANSCE facilities may also be required to develop an auditable safety basis if they are determined to be radioactive waste management facilities per DOE Order 435.1. LANSCE facilities have not been evaluated to assess the applicability of DOE Order 435.1.

LANSCE Activity-Level Hazard Analyses. For research and experimental work, the LANSCE division has implemented the SWP LIR. The LIR and associated LIG establish a graded approach to hazard analysis. In this process, researchers and their supervisors systematically identify the hazards associated with their work. Involvement of others (i.e., peers and ES&H) is based on a graded approach consistent with the magnitude of the hazard. A risk is associated with each identified hazard, and the uncontrolled risks are judged as being acceptable based on the likelihood of occurrence and consequences. The resultant judgment of whether the risk is high, medium, low, or minimal provides a guide to the rigor required in developing the controls.

The LANSCE hazard analysis process is further defined in an SWP implementing requirement document and in implementing requirements for experimental reviews.

At LANSCE, this hazard analysis process is further defined in a LANSCE SWP implementing requirement document and in a LANSCE FIR procedure for experimental reviews. The FIR is intended for use with all user experiments associated with the accelerator complex, which receive beams from the LANSCE accelerator. The FIR requires the person reviewing an experimenter's proposal to assign an experimental review level of low, medium, or high to the proposed experiment based on hazards, risks, and controls (including previously approved HCPs, as applicable). The FIR provides a useful method for implementing the SWP LIR associated with beam-related experiments at LANSCE facilities.

Researchers and management at LANSCE are familiar with the process, and most have received classroom training in the hazard analysis process. However, there are some shortcomings and this process requires further evaluation and correction, as described in the following paragraphs.

The experimental review FIR addresses beam-related experiments, but many experiments at LANSCE are not beam-related and are not encompassed by the FIR. However, the non-beam experiments can present a level of hazard that warrants LANSCE-specific guidance. Since there is no FIR for non-beam-related experiments, the hazard analysis process is defined only in the LANL SWP LIR and LIG. Unlike beam-related experiments, non-beam-related experiments do not require the same level of hazard analysis review (e.g., Experimental Safety Review Committee or safety review worksheet), although the experimental hazard may be comparable to the beam-related experiments and the risks could be greater. While the IVP concept provides an additional hazard analysis review at the facility restart level, it has not been applied at the experiment or work activity level.

The LANSCE hazard analysis process does not always document the decision-making process or the analysis.

The hazard analysis process (whether for beam- or non-beam-related experiments) documents only the

The Weapons Neutron Facility Complex

outcome of the process, but not the decision-making process or the analysis. That is, experimental hazards judged to be significant are documented in one or more HCPs associated with the experiment (e.g., a cryogen HCP or a mercury shutter HCP). The determination of the type and number of HCPs is typically the result of meetings with researchers and line management, in which other potential hazards are discussed and eliminated or judged to be adequately controlled through existing LANL procedures (e.g., LIRs and administrative requirements). This hazard screening process is informal and is often not documented or not rigorously documented (e.g., journals or interoffice memorandums). As a result, no clear record of the hazard screening and analysis process can be easily reconstructed.

Typically, industrial and radiological hazards are analyzed, but the analysis for some hazards is not documented. For example, at the Weapons Neutron Research facility (WNR), once the neutron beam is turned off, researchers (including visiting students) are permitted to withdraw materials that had been exposed to the neutron beam without radiological monitoring or radiological control technician coverage. The probability of neutron-exposed materials becoming moderately activated is usually minimal, and researchers handling such material probably do not require radiological monitoring. However, WNR has not documented the technical basis for their current practices and has not formalized guidance for what materials can or cannot be placed in the beam. Further, 29 CFR 1910.132 requires a documented hazard analysis and training to support the use of personal protective equipment. At LANSCE, routine use of personal protective equipment, such as chemical protective gloves, dust masks, or gloves for movement of lead bricks, is typically not supported by a documented workplace hazards assessment that meets the requirements of 29 CFR 1910.132.

Some industrial hazards are not fully analyzed.

Some industrial hazards do not receive sufficient analysis, and therefore are not adequately controlled. For example, several experiments performed by LANSCE groups require researchers to occasionally work at elevated heights or to access experimental areas using fixed or portable ladders. None of the HCPs, experimental proposal forms, or technical review worksheets address the hazards associated with working at elevated heights. Further, there is no LANL guidance (LIR or LIG) associated with elevated height hazards for non-construction workers, and the hazard is not addressed in LANL institutional or LANSCE facility-specific training. A LANL training course on fall protection and ladder safety is mandated for construction workers due to the requirement in 29 CFR 1926.1060, but there are no similar OSHA ladder training requirements for general industry (e.g., LANSCE researchers). However, since falls account for one of the leading causes of death and disability in industry, both the consequences and the likelihood of such an event may result in the uncontrolled risk being unacceptable. Researchers, including visiting researchers and students, who do not routinely work at elevated heights may be at greater risk than construction workers who routinely work at elevated heights and who are subject to required controls (e.g., ladder and fall protection training).

ISSUE: The LANSCE hazard analysis process does not provide for sufficient documentation and ES&H subject matter expert involvement, consistent with the LANL SWP requirements documents, when identifying and analyzing some industrial and radiological hazards (e.g., working at elevated heights and exposing materials to the neutron beam).

Although ES&H is an active participant in the review of HCPs, ES&H subject matter experts are not sufficiently involved in analyzing some hazards. Both the SWP LIR and the LANSCE FIR on technical and safety reviews of user experiments include some provisions for ES&H review. However, there are no well-defined thresholds for ES&H involvement to ensure adequate ES&H participation in the initial stages of hazard identification and analysis. For example, the SWP LIR requires ES&H concurrence on a review of controls only for high initial risk activities and does not require or recommend consultation with ES&H prior to authorizing work at any residual risk level. At LANSCE, ES&H is typically not involved in setting the experimental review level that, if determined to be low, requires no ES&H review and approval. There are no clearly delineated thresholds at LANSCE for involving the LANSCE ES&H team in many research activities. For example, ES&H suggested that they be involved during movement of lead bricks because of the potential for airborne lead exposure and the recent lead overexposure at TA-18 from moving lead bricks. ES&H personnel also suggested they should be involved if any waste management issues arise because they could help line management keep track of the multitude of recent changes in waste management regulations and LIRs. However, these suggested triggers/thresholds have not been communicated to the group leaders. LANSCE ES&H has not performed an assessment on in-process or completed experiments to validate that the level of ES&H involvement in hazard analysis at all stages of the hazard analysis process is adequate.

LANSCE does not have clear thresholds for involving ES&H subject matter experts in analyzing some hazards.

The experimental configuration change control process is addressed in the LANSCE FIR on technical and safety review of experiments. However, implementation of the process is not always rigorously documented. For example, a change in a WNR experiment being conducted by Texas A&M researchers introduced a diagnostic instrument with a small radioactive source. WNR management was aware of this change in the experiment, including the introduction of the radioactive source, and the subsequent controls (i.e., radiation source surveys). However, the experimental review and approval package was not revised to reflect the changes. No clear thresholds are established for the change control process, such as mandatory reviews and revision when a new hazard is introduced. One such threshold could be to require that the experimental review and approval package be revised whenever there is a change in the hazard inventory on the LANSCE experiment technical and safety worksheet (e.g., introduction of a new radioactive source).

Summary

Since 1998, LANSCE has made progress in developing and implementing a hazard identification and analysis process for research and experimental work. Researchers and line management are knowledgeable of hazards in their workplace and are generally well trained in the identification and analysis of workplace hazards. For research activities, the use of HCPs, when combined with the technical and safety review process for experiments, provides an effective process for identification and analysis of most of the significant hazards. Both LANSCE management and researchers were committed to thoroughness when analyzing hazards. In recent weeks, several LANSCE facilities (including MPF-18 and -14) have posted hazard awareness boards at the building entrances to better communicate building work activities and their potential hazards.

Notwithstanding these accomplishments, some of the initial stages of the hazard analysis process, such as hazard identification and screening, do not sufficiently involve ES&H subject matter experts and are not always well documented, or the documentation cannot be easily reconstructed. Also, the processes for screening and analyzing some experimental hazards are less rigorous than for facility hazards, although the hazards may be comparable. The ES&H-ID process that is described in the SWP LIG has the potential to minimize this inconsistency. Other areas of hazard analysis that require further development include:

completion of some authorization basis documents, improved documentation for hazard change control, and renewed emphasis on the identification, analysis, and documentation of standard industrial hazards (e.g., working at elevated heights).

Develop and Implement Hazard Controls

Core Function #3: Applicable safety standards and requirements are identified and agreed upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.

Hazard controls include engineering controls (e.g., buildings, enclosures, safety systems, ventilation systems, controls, and instrumentation), personal protective equipment (e.g., protective clothing, respirators), and administrative measures (e.g., limits, safety requirements embedded in procedures, warning signs, and training). The established levels of controls must be consistent with the need to protect workers, the public, and the environment from all hazards associated with work activities.

Facility-level controls for operation of the LANSCE accelerator, such as operating procedures, are well established, documented, and in conformance with the conduct of operations requirements set forth in DOE Order 5480.19. Changes in accelerator operations are rigorously controlled and reviewed by the LANSCE Radiation Safety Committee for potential impact on the health and safety of the workers.

SWP requirements and guides establish the process for developing controls for non-facility work.

The SWP LIR and LIG establish the process for developing controls for non-facility work (e.g., research, experiments, and supporting work activities). The SWP process is based on a preferred hierarchy of elimination, substitution, engineering controls, administrative controls, and personal protective equipment. The essential activity in the SWP process is the development and documentation of activity-level hazard control systems that are commensurate with the level of risk. The SWP LIR has been implemented at the LANSCE division level through a LANSCE Division Implementing Requirement (LDIR). Hazard controls are established at the experiment level, as described in the following paragraphs. However, facility or building-level controls, such as building safety envelopes, do not adequately address the controls for aggregate hazards resulting from multiple experiments in the same building.

At the activity level, documentation of the LANSCE hazard control system for an experiment consists of one or more HCPs for non-accelerator beam experiments and a research "work package" for beam-related experiments. The research work package typically consists of the research proposal, a technical and safety review, approval form, and other applicable documents and permits, such as HCPs and radiological work permits. For most beam and non-beam experiments, the HCP is the cornerstone of the hazard control system. HCPs are required when new controls are developed or existing controls are modified. In general, for those hazards that are addressed in an HCP, controls and their limitations are identified, explained, and well documented. However, for hazards that are to be addressed by existing institutional controls, the documentation of the hazard and/or the hazard control is often lacking. Although such documentation is not required by the SWP LIR, the hazard control system is incomplete if it does not document the hazard and associated institutional control or procedure. Similarly, the LANSCE experimental review procedure (53 FIR 300-00-01.0) and associated safety review worksheet include a hazard inventory checklist, but no provision to document the controls associated with the identified hazards. This is inconsistent with the ISM intent of clearly documenting controls for each identified hazard.

For some LANSCE experiments, the hazard or the controls associated with the setup, testing, or disassembly of the experiment are not documented.

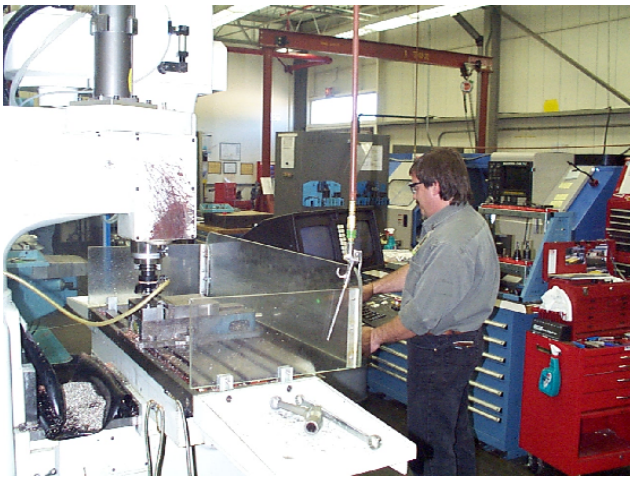
For some LANSCE experiments, institutional ES&H controls are not adequately identified and documented in the hazard control system. Some hazard control plans focus only on the operation of the experiment and occasionally fail to document either the hazard or the controls associated with the setup, testing, or disassembly of the experiment. Few experiments identify the controls, such as training or workplace evaluations by ES&H, to mitigate ergonomic hazards or hazards associated with working at elevated heights. Movement of lead bricks is a growing concern at LANL facilities, particularly since the stacking of lead bricks in TA-18 resulted in a worker overexposure

to lead dust. Like TA-18, many LANSCE experiments involve lead handling. All LANSCE workers interviewed had received lead awareness training. LANSCE industrial hygiene has also increased the frequency of lead air sampling during movement of lead. However, LANSCE, has not developed a lead handling procedure to articulate LANSCE-specific lead handling and storage requirements, such as establishing thresholds for contacting LANSCE's industrial hygiene department to conduct air sampling for lead. Few HCPs specifically address the hazards and controls for movement of lead bricks.

The identification of institutional controls and linkage of institutional controls to work activities need improvement. For most LANSCE groups, the work inventories do not identify institutional controls that govern the work activity. While identifying these controls is not required, inclusion of institutional controls for low-hazard work in the inventories could enhance the identification of controls for that work. Such controls could improve the integration of the institutional controls and help remind workers and supervisors of the requirements.

Systems for identifying the worker knowledge, skills, and training needed to control hazards are well developed.

Systems to identifying the knowledge, skills, and abilities needed by workers, including the training required to handle the hazards and effectively use the controls, are well developed. Task-specific training, skills, and abilities to perform work and research activities are documented, tracked, and current with respect to ongoing work activities. For example, specification and validation of training requirements for access to and use of machine shops at Building MPF-18 were exemplary and could serve as a model for machine shops across the DOE complex. The LANSCE division training department maintains an updated training database and assists group leaders in determining the training status of their workers. In general, the LANSCE training department notifies group leaders when training requirements are about to expire, so that training can be renewed without lapses. Some LANSCE groups have developed innovative systems for tracking training requirements of their staff. For example, LANSCE Group 1 has developed a training matrix that identifies training requirements for different



LANSCE Group 2 machine shop operations

types of workers (i.e., residents, longer-term students, working guests, and non-working visitors). Color-coded highlighting of training requirements and work activities clearly identifies work authorization levels for specific tasks.

ISSUE: At LANSCE, institutional controls (e.g., procedures and training) for some work activities are not adequately identified, documented, or linked to work activities. Clear linkage of LANL institutional requirements and controls to work activities is required by the LANL ISM description document.

Overall, the LANSCE ES&H training program is effective. However, there are some concerns with respect to training programs for common industrial hazards that workers could routinely encounter. For example, few LANSCE group leaders were aware of the LANL training requirements for use of dust masks. LANSCE group leaders do not periodically receive information from ES&H on workers who are enrolled in the site hearing conservation program or on limitations when moving lead. A review of hearing conservation program records for two LANSCE groups indicated that the listing of personnel did not reflect current job assignments. Some workers had not received the initial hearing protection training, and none of the workers interviewed could recall receiving annual refresher training in hearing protection. For some hazards (e.g., working at elevated heights, ergonomics), site training courses have been developed, but no training requirements are prescribed for non-facility workers. As a result, training for these hazards is not routinely identified or prescribed as a hazard control measure.

For example, a review of training records for three researchers from the Physics Division at Area C, who occasionally work at elevated heights, indicated no fall protection training. However, if these researchers had been construction workers, fall protection training would have been required if they were performing similar work. In many cases, training requirements for common industrial hazards (fall protection, hearing protection, and dust masks) are not identified or tracked by LANSCE group leaders.

Although improvements have been made, a number of deficiencies were observed in SEWPs and the placarding of forklifts, indicating that some previously implemented controls have not been sustained.

Since the 1998 DOE Office of Oversight review of LANSCE, progress in the use of SEWPs and placarding of forklifts is evident throughout LANSCE facilities. However, a number of deficiencies were observed in both SEWPs and forklifts, implying that some previously implemented controls have not been sustained. For example, sections of the SEWPs were not completed as required by procedure. LANSCE Group 5, in an effort to tailor the SEWP form to their work activities, modified a mandatory LIR form and eliminated an Electrical Safety Officer notification block and an authorizing signature. The text on the form and other mandatory fields was also modified. Some completed SEWPs do not reference procedures or instructions to perform the work. Numerous SEWPs were authorized, but the work duties were not identified on the form. A few SEWPs were authorized with no identified start or expiration date. Many SEWPs did not have both an approval and authorization signature as required by procedure. As a result, LANSCE management stopped work being performed under SEWPs and performed reviews and reapprovals of the deficient SEWPs. Increased management attention is needed to ensure that deficiencies in the implementation of SEWPs are corrected and do not recur.

During area walk-downs and observation of work, Oversight evaluators identified a number of deficiencies related to inspection and maintenance of forklifts. Some corrective action and recurrence control issues from the forklift accident were also identified during the February 1998 accident follow-up evaluation. The deficiencies included missing information on placards (recurring deficiency), missing and outdated fire extinguishers, missing inspection stickers, a forklift not marked as "out of service," and mechanical deficiencies. These deficiencies, while promptly corrected when identified, indicated continuing problems with ensuring that institutional controls are properly implemented and sustained during day-to-day operations and work activities.

A significant amount of non-UL (not listed by Underwriter's Laboratory) electrical equipment is in use at LANSCE. It is estimated that at LANSCE, more than 200,000 items of electrical equipment may not be UL-listed. Lacking institutional guidance, LANSCE has developed a draft procedure to guide the process of reviewing and documenting unlisted equipment. The process includes a graded risk-based approach that would focus resources on the highest-risk equipment and formalizes the review for all new and fabricated unlisted equipment. When implemented, the procedure has the potential to provide adequate control of non-UL-listed equipment. Because other LANL divisions could also benefit from such a process, the LANSCE process should be considered for institutionalization at all LANL divisions.

LANSCE needs to ensure that building emergency plans are usable by building occupants and line management.

Development of comprehensive building emergency plans for use by building occupants and line management needs improvement at LANSCE. Building emergency plans consist of building maps, TA-53 emergency procedures on the facility management Web site, run sheets, and emergency checklists. While the TA-53 emergency procedures provide generic guidance for building occupants, only the building maps are building-specific and occupant-oriented. The run sheets and emergency checklists are intended for use by the emergency responders (e.g., fire department). Although LANSCE has complied with institutional requirements for emergency plans, LANSCE building emergency plans for building occupants are lacking in several areas. Building evacuation maps do not satisfy all OSHA 29 CFR 1910.38, 29 CFR 1910.120, or DOE Order 151.1 requirements for building emergency plans. Some missing elements include emergency escape procedures; procedures to be followed by workers who remain to operate critical operations before they

evacuate; rescue and medical duties; and identification of personnel who can be contacted for further information. There are no routine emergency drills, and some LANSCE facilities do not have clearly marked rally points. Some researchers, due to the location of their research work, have not been included in an emergency plan. For example, the WNR building evacuation plan does not consider the outlying experimental sheds that are used by visiting researchers and students. Emergency evacuation information is not always presented in pre-job briefings (e.g., Prairie View A&M experiment at WNR). Some building emergency plans are outdated. For example, one Building MPF-17 floor plan did not reflect the correct room occupants or identify new exit doors or the location of any oxygen-deficient alarms.

Some building emergency alarm systems are not routinely tested (e.g., oxygen alarm system in Building MPF-17). Several LANSCE buildings include a variety of audible and visual alarms, which are unique to particular experiments, and other building occupants are not trained to recognize them. For example the BANSHEE project in Building MPF-17 has audible and visual alarms for high voltage, machine operation, and radiation hazards. However, occupants of Building MPF-17, who are not associated with the BANSHEE project, have not received training on emergency actions to be taken if these alarms are actuated. HCPs typically contain some emergency actions; however, the emergency information contained in HCPs is not consistently or adequately presented, is often difficult to locate within the HCP, and would not allow a timely response to an emergency. For example, emergency actions are not separated and may confuse the responder. Some action steps are intermingled with information and cautions. Some emergency actions do not have assigned responsibilities, and it is not always clear when outside assistance is to be summoned. LANSCE ES&H and LANSCE management have recognized many of these deficiencies in their current emergency plans and are updating building maps and hiring an additional ES&H professional whose initial task will be to develop building emergency plans that building occupants can use.

ISSUE: At LANSCE, comprehensive building emergency plans have not been fully developed or demonstrated to be effective through documented drills and exercises, as required by applicable OSHA and DOE order requirements.

Hazardous chemicals are generally well labeled, segregated, and stored in the appropriate cabinets. The chemical labeling and storage practices in several LANSCE facilities (e.g., Building MPF-14) were exemplary. However, some concerns in the use and storage of hazardous chemicals were noted during walk-downs of LANSCE facilities. The LANL ESH Group 5 recently completed a TA-53-wide chemical inventory, and responsibility for performing inventories was subsequently transferred to line management. However, none of the LANSCE group leaders interviewed has assumed the responsibility for implementing the annual inventory of chemicals as required by LANL Procedure AR 1-9. Many group leaders did not display a clear understanding of inventory requirements and lack training in the use of the Automated Chemical Inventory System. Some chemicals were not bar-coded, indicating that the chemicals had not been entered into the sitewide chemical tracking system. Some LANSCE groups are procuring small quantities of some chemicals (e.g., degreasers and strippers) through local hardware stores, and without benefit of the LANL stores procurement and the industrial hygiene review processes. Some Material Safety Data Sheet books were outdated. A few legacy and surplus chemical issues were also identified. For example, one Material Safety Data Sheet book in Building MPF-17 had no owner, since the experiment had ended and the experimenters had left. A small quantity of a pyrophoric metal (strontium) was located in a chemical cabinet in Building MPF-17, but the metal was no longer needed.

Summary

Institutional and LANSCE-specific policies and procedures for hazard controls have been developed and implemented for research activities at both the facility and work-activity level. Workers and supervisors are involved in the documentation of hazard controls. However, further improvement in developing and implementing controls would provide an additional safety benefit. Building safety envelopes have not been established to identify aggregate controls for buildings with multiple experiments and hazards. Some work inventories did not adequately identify institutional controls. Although HCPs sufficiently document controls for significant experiment-related hazards, not all research-related work is addressed in an HCP. Some LANSCE processes, such as the LANSCE

experimental review, need strengthened provisions for identifying and documenting the controls for identified hazards. LANSCE ES&H, which is most knowledgeable of institutional controls, is not always effectively engaged with line management in providing guidance on institutional controls and in implementing an evolving set of ES&H LPRs, LIRs, and LIGs.

Training programs, including training requirements, tracking of training status, and instruction provided to workers and line management, are methodical and well-structured, and they address most workplace hazards. However, implementation of training programs and requirements for researchers in some ES&H areas, such as hearing protection and fall protection, needs improvement. Building emergency plans and the documentation of experimental emergency actions are not consistent with industry standards. Housekeeping, safety postings, and chemical labeling and storage are generally excellent, with a few exceptions related to chemical inventories and legacy chemicals.

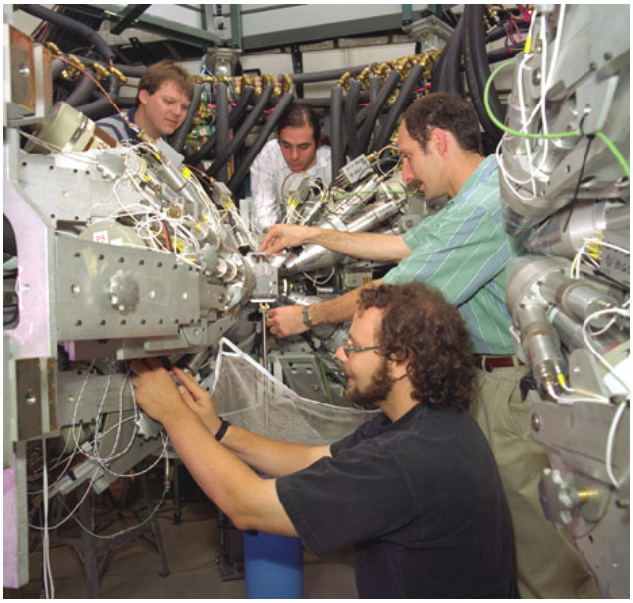
Overall, hazard analysis and controls have improved since the 1998 Office of Oversight review and have further improved since the 1999 safety stand-down as a result of worker input. However, additional improvements are needed, some of which require additional management attention.

Perform Work Within Controls

Core Function #4: Readiness is confirmed and work is performed safely.

Safely performing work is the culmination of well-defined and properly analyzed work with appropriate controls and supervisory oversight commensurate with the risk of the work activities performed. A rigorous process is necessary to confirm adequate preparation and readiness to begin work prior to authorizing work at the facility, project, or activity level. The formality of the process, the extent of documentation, and the level of approval should be based on the hazard and complexity of work.

For LANSCE, the LANL SWP LIR and LDIR SWP implementation procedure establish requirements and formal mechanisms, and define the process for authorizing work with a higher level of authorization for higher hazard work. These processes include requirements and guidance for authorization of workers to ensure that knowledge, skills, and training are



Researchers working on an experimental setup for the GEANIE experiment

appropriate to the tasks. These mechanisms are integral to the process of defining the work and preparing HCPs for all work with initial hazards evaluated as medium to high, and all work with residual hazards (risk after appropriate controls are applied) of low, medium, or high. Change control processes specified in SWP procedures are being appropriately used to make changes to HCPs. The concept of work release—after work has been approved and authorized, verifying that it is safe to start the job immediately prior to commencing work—is not well documented in the SWP LIR. However, various types of meetings, such as morning stand-ups, plan of the day, plan of the week, scheduling meetings, and direct supervisory oversight, provide some compensation to ensure that conditions have not changed since the work was approved and authorized. In addition, implementation of the EAM and lead tenant functions will facilitate identification of conditions that may have changed.

Work observed by Oversight was performed safely, with few deficiencies.

LANSCE division management and group leaders understand and are committed to performing all work safely. Personnel interviewed at all levels were familiar with SWPs and the ISM core functions (called the five-step process at LANL) for performing safe work. Oversight evaluators found that, in general, the work

they observed was performed safely, with few deficiencies. The hazard analysis process, work controls, and documentation have improved since the 1996 Office of Oversight safety management evaluation and the Office of Oversight 1998 accident investigation follow-up review. With few exceptions, the implementation of new controls has resulted in improved performance and the safe conduct of research and experimental work at LANSCE. Although a step forward, the SWP process is still relatively new and evolving, and some implementation deficiencies were evident.

At WNR, the experimental personnel performing Prairie View A&M experiments were knowledgeable of LANSCE and WNR safety requirements presented by the WNR group leader and safety officer during a pre-experiment safety briefing. Oversight evaluators observed portions of the user check-in and briefing processes, experimental setup, and the experiment and identified no performance or safety deficiencies. The experiment involved testing the effects of the neutron beam on electronic components and assemblies. Engineered features, such as the personnel safety system, administrative controls, and safety briefings, facilitated safe performance of the experiment. The equipment setup and operation of the WNR experiment (referred to as GEANIE) was also reviewed. This experiment involved working with liquid nitrogen (a cryogen) and plutonium samples. The personal involvement of the WNR group leader and WNR safety officer in day-to-day operations was evident.

A few deficiencies were identified in the setup and operation of an experiment.

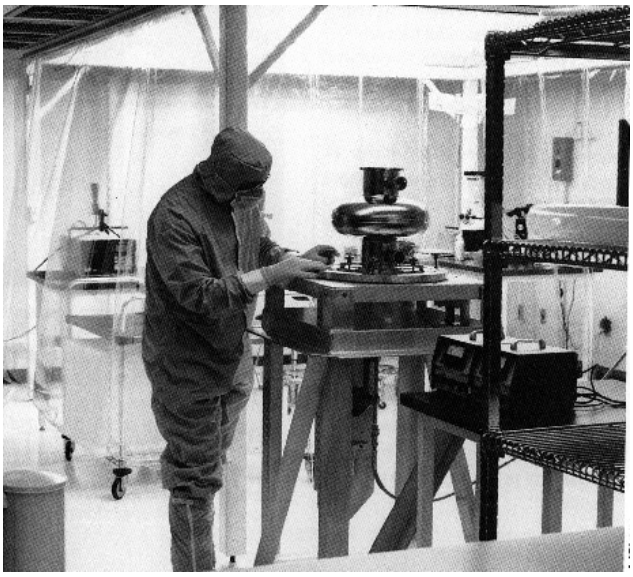
The Office of Oversight team identified a few deficiencies associated with the GEANIE experimental work. Maintenance activities to remove ice dams from the GEANIE liquid nitrogen fill tubes were not addressed by the HCP. Although the HCP acknowledged that freeze-ups could occur, it provided no precautions, limitations, or details on isolating the source of nitrogen, disassembling and thawing the tubes, or reassembling the equipment. The operation, though not complex, involved the hazards of cryogens and energy isolation.

Research support work observed in Building MPF-18 included LANSCE Group 9 BANSHEE upgrade modifications, LANSCE Group 3 lead-bismuth test loop maintenance, LANSCE Group 2 test assembly work, and minor research support work in the Building MPF-18 machine shop. The Oversight team also observed limited work activities associated with cavity testing in Building MPF-17. Work was being safely performed in all areas in both buildings. However, as noted under Core Function #1, the scope of some routine research and experimental maintenance and modification work was not well documented.

LANSCE machine shop operations were notably effective in ensuring safety.

The LANSCE machine shop operations were conducted with rigor and high regard for safety. The machine shop operations were identified as a noteworthy practice based on the following:

- No injuries in the machine shops for several years
- A full-time dedicated journeyman machinist to run the Building MPF-18 shop and oversee operations
- Current posted qualification and certified operator listings
- Key control and locks to prevent unauthorized use
- The absence of any machine safety deficiencies, such as guarding and grinder clearances



Superconductivity testing within the clean room of Building MPF-17

- Proper posting and warnings

- A documented training program that included institutional, LANSCE general safety, and machine-specific training.

The LANSCE Group 2 and the Engineering Sciences and Applications Division-Design Engineering machine shops in Building MPF-17 were also in excellent condition, with current posted qualification and certification listings and a single person in charge assigned to each machine shop. Machine tools were in good repair, with well-marked disconnects. A few minor deficiencies were identified. In the Engineering Sciences and Applications Division-Design Engineering machine shop, a welding station (possibly inactive) had the ventilation exhaust duct blocked. The station was not marked as "out of service." In the LANSCE Group 2 machine shop, a machine disconnect switch was obstructed by a ladder, and machine access was restricted by a forklift. These deficiencies were promptly corrected.

Workspace safety and housekeeping at LANSCE are generally good.

Oversight evaluators performed walk-downs to evaluate workspace safety in Area C (line C), Building MPF-17, Building MPF-18, WNR, parking lots, and outside storage areas. Workspace safety and housekeeping at LANSCE are good to excellent in all areas. Numerous housekeeping deficiencies, identified by extensive management walk-downs associated with the LANSCE stand-down, had been corrected in all facilities. Chemical and flammable storage and labeling were excellent, with some exceptions. Postings, with minor exceptions, were current and correct. Some safety deficiencies indicated the need for better workspace surveys, more involvement of ES&H personnel in area walk-downs, and better attention to detail by workers, supervisors, and management in day-to-day operations during the performance of work. A few power panels and some emergency equipment were partially obstructed by storage. In Building MPF-18, several transformers had damaged top covers, presumably by previous work activities or improper storage on the transformers.

Work being performed under many current and recent SEWPs was not properly authorized or documented in accordance with procedures as discussed under Core Function #3, Hazard Controls. Readiness to perform work was not properly verified, and authorizations were not documented as required by SWP and supporting LIRs. When identified, management promptly stopped work under those SEWPs.

Recent reportable events indicate deficiencies in implementation of SWPs at the LANSCE Lujan Center.

Before and during the evaluation period, three reportable events indicated more serious deficiencies in implementation of SWPs at the LANSCE Lujan Center. These events included a contamination of an individual working in a utility trench, overpressurization of a flow meter by an unauthorized pressure test, and a hydraulic event associated with a release of pressure to a radioactive liquid waste system. The three events over a short period of time indicated a need to review SWP implementation at that facility, particularly as it relates to R&D equipment, and to determine applicability to other facilities. The LANSCE Director appointed an investigative team and brought in institutional support to review each event and the cumulative implication of the series of events. Although a final evaluation of these events is not complete, the events reflected weaknesses in implementation in some aspects of all five core functions of ISM.

Not withstanding the improvements, safety deficiencies were identified during the evaluation. During the scoping visit ladder deficiencies and questionable shoring for an excavation were identified outside the Lujan Center. Although the basis for the removal of the shoring was that personnel were no longer required to work in the trench, the presence of the ladder could have led to an unsafe entry into the trench/pit. Forklift deficiencies continue to be identified. During the evaluation, a fall protection issue was identified for roof work on a building near the LANSCE cafeteria. After identification, LANSCE management promptly addressed these issues. However, continued management and supervisory attention is needed to ensure that supervisors integrate institutional and LANSCE requirements into all work activities.

Summary

Most work observed as LANSCE was performed safely and within the controls established by ISM, the core functions, and the recently implemented SWP

procedures. Walk-downs and interviews indicated that group leaders, supervisors, and workers had accepted the changes and were active in improving implementation to ensure safe work. LANSCE R&D researchers and users were observed to work professionally and safely, with few deficiencies.

Notwithstanding the improvements, continued refinement of SWP processes and implementation is needed to fully address complex research and experimental activities. Identified safety deficiencies indicated that continued work is needed in implementing SWP requirements. The recent events at the Lujan Center indicate specific areas where the SWP process has not been adequately implemented. They may also have broader implications for SWP implementation across LANSCE.

Performance Feedback and Continuous Improvement

Core Function #5: Feedback information on the adequacy of controls is gathered, opportunities for improving the definition and planning of work are identified and implemented, line and independent oversight is conducted, and, if necessary, regulatory enforcement actions occur.

The concept of continuous improvement requires that line management establish formalized mechanisms and processes for identifying and documenting ES&H-related deficiencies and for tracking corrective actions. To ensure that corrective actions are timely, complete, and effective, a firm technical basis and the responsibility for timely implementation must be clearly identified. To avoid event recurrence, line management must establish a process for disseminating lessons learned to affected personnel, both internally and across the DOE complex.

LAAO. Until mid-1999, LAAO oversight and day-to-day assessment of LANSCE activities were performed through full-time coverage by an experienced and knowledgeable LAAO Facility Representative (FR) who was assigned to LANSCE. Since mid-1999, changes in FR assignments and the resignation of the experienced FR resulted in a lapse in coverage and reduction in the effectiveness of LAAO oversight of LANSCE division activities. The resignation of the experienced FR and subsequent assignment of a temporary FR resulted in a loss of continuity and facility-specific knowledge.

The LAAO FR program has suffered from personnel turnover and resource constraints.

A new FR, dedicated to LANSCE, was hired in September 1999 and has started the qualification process. However, it will be some time before the new FR is fully qualified and familiar with LANSCE activities. The FR program has suffered from personnel turnover and resource constraints, and it lacks sufficient LAAO management involvement to fully support the program. This observation was communicated to the ISM verification team.

Institutional. Since the 1996 Office of Oversight safety management evaluation and the 1998 accident investigation follow-up review, there have been numerous improvements in the LANL lessons-learned program that affect and benefit all LANL organizations, including LANSCE. These include:

- Implementing of a LANL lessons-learned Web site where lessons learned are categorized into nine safety categories
- Establishing hyperlinks from each LIR and LIG to the LANL lessons-learned Web site
- Implementing a “Smart Safety” program for use by line managers
- Linking the management walk-around system report page to a lessons-learned form page
- Doubling the number of lessons-learned alerts published on the DOE lessons-learned list server
- Creating a LANL lessons-learned network
- Gaining global user access to the management walk-around system and the safety concern program Web site
- Initiating a review of all safety concerns and management walk-around findings for lessons learned
- Developing a tri-laboratory lessons-learned program proposal for LANL, Lawrence Livermore National Laboratory, and Lawrence Berkeley National Laboratory that was accepted by the University of California.

A user-friendly Web-based program promotes access to lessons-learned information.

These improvements were instrumental in strengthening the accessibility of the information to all LANL organizations and generating more lessons-learned documents. A review of the Web-based program and changes in the TA-53 facility-specific training indicated improvements in the ability of workers, supervisors, and managers to access lessons-learned information relevant to research and experimental activities. The Web-based program is user-friendly and well organized.

The LANL audits and assessments organization conducted independent assessments of FSPs, FTAs, and SWPs. The results of these assessments rated these documents as "fair" and indicated the need to develop additional subordinate documentation to implement the FSPs, FTAs, and SWPs, to complete details in the documents, and to communicate the documents' information to personnel. Although providing useful feedback, the assessments do not provide an in-depth review of implementation at the activity level and thus do not mitigate the lack of a comprehensive LANSCE self-assessment program (discussed later in this section).

Workers clearly understand their right to refuse to perform any work that could be unsafe, but the stop-work procedure continues to be deficient.

During the 1998 accident investigation follow-up review, deficiencies were identified in the stop-work institutional LIR. Worker empowerment was and continues to be excellent. Workers who were interviewed clearly understand their right to refuse to perform any work that could harm themselves, the environment, or the public, and their responsibility to stop any work they observe to be unsafe. However, the stop-work LIR had weaknesses in notification to management and documentation requirements, and allowed "interested parties" (the supervisor in charge of the potentially unsafe work) to determine who gets notified, whether the stop-work is documented, the need for and type of corrective action, and authority to restart work. Facility managers were required to be notified only if the stop-work affected the facility safety envelopes. Imminent danger was not addressed, nor were contract implications for subcontractors.

ISSUE: At LANL, the stop-work procedures do not fully implement the requirements of DOE Order 440.1A and the intent of DOE Order 5480.19, as referenced in institutional requirements. This weakness was previously identified by the Office of Oversight.

LANL has been working on a revision of the stop-work LIR since 1998. However, after nearly two years, the revised LIR is still in draft and has not been finalized; the deficient LIR is still in effect, and the problems have not been corrected. The failure to address these longstanding and recognized deficiencies results in part from an inability to achieve consensus among various laboratory organizations. However, in the absence of a consensus, LANL management has failed to provide the necessary leadership to resolve issues and disputes in a timely manner, resulting in a situation where a flawed procedure has been uncorrected for nearly two years. A review of the current draft of the revised stop-work LIR, which is scheduled for implementation by December 31, 1999, indicates that some of the weaknesses have been addressed. However, the current draft shows continuing weaknesses in certain areas, including notification of management and documentation.

LANSCE developed and applied the IVP/Independent Verification Board (IVB) process as a mechanism for the timely and graded restart of medium or high initial risk activities. However, this process has not been institutionalized throughout LANL, and LANL may benefit from an institutional procedure to address any stand-down of activities.

Institutional guidance for conducting critiques is lacking.

There is no formal institutional guidance for line management that describes how to conduct a critique. Some essential elements important to critiques were not fully addressed in critiques of the Lujan Center events. A detailed time line upon which to base findings of fact was not established, key personnel (emergency responders) did not attend the critique, statements of witnesses were not taken or made available to attendees, copies of applicable procedures were not made available to attendees, and assignment of action items was informal and did not include a documented statement of the action, responsible party, and due date

for the action. The critique process does not meet the intent of DOE Order 232.1, *Occurrence Reporting and Processing of Operational Information*, for investigation of abnormal events.

ISSUE: LANL institutional processes for critiques do not fully implement DOE Order 232.1 requirements for investigation of abnormal events. The lack of a formal process demonstrated the need for more effective critique processes, as observed by Oversight at the division level.

LANSCE. LANSCE management demonstrated a conservative approach to safety in ordering a full division stand-down based on growing safety concerns stemming from a number of minor events. This action demonstrated management leadership and commitment to safety over cost and production. The stand-down was an effective feedback and improvement process used to examine non-injury precursor events, and to apply lessons learned to processes and personnel to avert more serious events. LANSCE management has effectively used lessons learned from other stand-down/restart activities at LANL and applied them to LANSCE. Lessons learned from previous events were integrated into the LANSCE facility-specific training and addressed at division and group meetings.

The IVP process was developed and applied to restart of activities at TA-53.

The IVP/IVB process was developed and applied to restart of all activities at TA-53, except those with low or minimal initial risk. A restart planning team appointed to develop processes to continuously improve the restart process is in place and has been effective. The IVP process similar to that used at the chemical and metallurgy research facility and TA-18 was developed to advise the management on the restart of activities other than low and minimal hazard work. This created a "hold point" for hazardous activities to ensure that programs, procedures, and training were adequate before restart. Each IVP reviews the work environment; reviews work activities to ensure that hazards are identified, and HCPs are in place and understood; confirms that work to be authorized is in the group's work inventory and is authorized by the appropriate level of management; confirms that training plans are complete and workers are authorized; ensures that workers understand their safety responsibilities and have the opportunity to bring up safety issues; and categorizes action plans to address safety concerns that resulted from the stand-down. This methodology provides a good framework for startup/restart of facilities/activities.

Measuring how well lessons learned are fully understood and used by targeted audiences remains a challenge. Few formal mechanisms exist at the group level to test the flowdown and effectiveness of lessons learned and ensure that additional controls are developed or modified when necessary. For example, lessons learned from a lead overexposure at TA-18 were disseminated but failed to result in improved controls or thresholds for lead handling at LANSCE. Lessons learned were disseminated to LANSCE, but evaluation and action to put additional controls in place to prevent lead overexposures have not been implemented for LANSCE facilities. LANSCE completed some monitoring and periodic checks but has not implemented additional controls and thresholds to trigger those controls. In another example, personnel who supervise welding and cutting activities were not familiar with recent ozone overexposures across the DOE complex. In some cases, personnel were not aware of lessons-learned information that was directly relevant to their job performance. There have been four events within last two years at DOE sites that caused ozone overexposures; LANSCE ES&H and personnel who supervise welding and cutting displayed little knowledge of those events and thus had not performed any review to determine the need for additional controls. This issue is identified in the LANSCE ISM improvement plan.

Management walk-arounds were instrumental in identifying a number of deficiencies that could affect personnel and facility safety.

The management walk-around program at LANSCE is a positive measure to ensure that managers routinely perform focused walk-downs to review work spaces and work activities under their control. The management walk-arounds conducted as a result of the LANSCE stand-down were instrumental in identifying a number of performance issues, material deficiencies, and poor housekeeping that could affect

personnel and facility safety. Corrective action for many of those issues was evident in areas evaluated by the Oversight team. Housekeeping, building condition, storage of chemicals and flammables, and posting and labeling were good to excellent. In order to improve the management walk-around process, division management enlisted the help of an industry mentor to assist managers during walk-arounds.

The Oversight review of the results of LANSCE management walk-arounds indicated that more focus is needed on personnel, performance, and work activities in addition to housekeeping issues. Additionally, specific activities should be targeted, based on previously identified deficiencies, trends, events, and results of other assessments. Guidance cards for management walk-arounds provided a good starting point but were not as useful for experienced managers. The Oversight team identified numerous deficiencies that were readily observable and should have been identified and corrected by workers, supervisors, and managers. It was also noted that ES&H representatives rarely participate with managers in the walk-arounds. Participation by ES&H would help train managers in the multitude of safety disciplines and detailed requirements.

Other than management walk-arounds, the LANSCE division and group self-assessment process is mainly informal, lacks rigor, and has not evolved into a mature program. Although some fragmented self-assessment is performed, assessments do not routinely address a range of facilities, discipline areas, work activities, and problem areas based on prioritized assessment schedules and assessment planning. Few LANL ESH Group 5 assessments are performed at LANSCE, and industrial hygiene participated in only one LANSCE group assessment during the past year. Management expectations for the group level and ES&H self-assessments are not clearly articulated. A stronger self-assessment process might have identified many of the deficiencies identified by the Oversight evaluators. This issue is recognized by management and is partially addressed in two elements of the LANSCE ISM improvement plan. However, the elements are not yet sufficiently defined to ensure that they would encompass all areas necessary for an effective self-assessment program.

ISSUE: At LANSCE, an effective self-assessment program, consistent with DOE requirements for self-assessments (as delineated in LIR 307-01-01, "Safety Self-Assessment") is not in place to provide continued assurance that ISM, particularly SWPs, remains adequately implemented and is continuously improved at the group and activity levels.

The feedback and improvement process is not well established and documented for routine research, work, and experimental activities. The academic and collegial environment at LANL and LANSCE promotes a great deal of informal feedback through meetings, reviews, e-mail, and other means. However, the feedback and improvement processes varied widely among groups, were not well defined by SWP or experimental review procedures, and were not well documented in practice. LIR 300-00-01.0, "Safe Work Practices," Section 7.5 prescribes provisions for reviewing the effectiveness of controls and using lessons learned for control failures, near misses, or accidents. LANSCE facility implementing procedure 53 FIR 300-00-01.0, "Technical and Safety Review of User Experiments at LANSCE," and LDIR 300-00-01.0, "LANSCE Safe Work Practices Implementation," do not address feedback requirements or documentation. Feedback, before near misses and below the level of failures, is necessary for all work activities, to prevent control failures, near misses, event initiators, and events. Pre-emptive feedback from workers and supervisors for all work activities is an essential element of ISM and the five core functions.

LANSCE does not have an integrated system for capturing, analyzing, and tracking corrective actions, issues, and ES&H deficiencies.

Within LANSCE, there is no integrated system to capture, analyze, and track corrective actions, issues, and ES&H deficiencies. Fragmented systems throughout parts of the organization provide some mitigation but preclude effective trending and analysis across LANSCE to improve overall organizational

performance. A formal system also provides a documented mechanism to perform risk-based prioritization, rollup of similar issues, assignment and tracking of responsibility, corrective actions, due dates, and completion dates, and provide thresholds for entry into the system. Separate systems were used to track issues from the IVP, the stand-down, the Radiation Safety Committee, and independent assessments. LANSCE management recognizes the need to establish an integrated system and plans to establish such a system and hire additional staff to perform issues management functions.

Overall, the JONs from the microwave accident investigation have been adequately addressed by LANSCE. The specific JONs that Oversight evaluated as not fully satisfied during the 1998 follow-up evaluation are addressed in Appendix B of this report.

Summary

LAAO oversight and day-to-day assessment of LANSCE activities has degraded because of changes in FR assignments and the loss of a key FR. At the institutional level, there have been numerous improvements in the LANL lessons-learned program. LANL institutional-level assessments have been performed but did not provide an in-depth assessment of implementation at the activity level. After nearly two years, LANL has not corrected significant weaknesses in its stop-work process.

The LANSCE stand-down was an effective feedback and improvement process used to examine non-injury precursor events and to apply lessons learned to processes and personnel in order to avert more serious events. LANSCE management has effectively used lessons learned from other stand-down/restart activities at LANL and applied them to LANSCE. Although lessons-learned processes have been improved, LANSCE does not have a formal process for ensuring that lessons learned are being evaluated and applied by LANSCE groups.

The management walk-around program at LANSCE is a positive measure to ensure that managers routinely perform focused walk-downs to review work spaces and work activities under their control. This program was instrumental in identifying a number of performance issues, material deficiencies, and poor housekeeping that could affect personnel and facility safety. Other than management walk-arounds, the LANSCE division and group self-assessment process is mainly informal, lacks rigor, and has not evolved into a mature program. Within LANSCE, there is no single formal system to capture, analyze, and track corrective actions, issues, and ES&H deficiencies. The Laboratory Issues Management and Corrective Action System, including the Issues Management Tracking Database (I-Track), could be linked to the LANSCE division to address this issue.

Increased LANSCE management attention to performance feedback and continuous improvement processes is needed to ensure that ongoing ISM improvement efforts achieve their objectives. Recent occurrences indicate some deficiencies in the discipline, rigor, and adherence to requirements expected by LANSCE management. Timely improvement in management feedback systems, including self-assessment and corrective action programs, is necessary to provide continued assurance that ISM, core functions, and work processes are adequately implemented and are continuously improved.

3.0 Opportunities for Improvement

The follow-up review conducted by the Office of Oversight identified several opportunities for improvement, the purpose of which is to provide line management with feedback that may help to address identified issues and establish actions that should be considered. The opportunities for improvement are intended to assist line management in identifying options, potential solutions, and potential enhancements to their programs. The responsible DOE and contractor line management should review and evaluate the opportunities for improvement enumerated below, as well as the specific suggested actions listed under each item. However, the opportunities for improvement and suggested actions are not intended to limit the initiatives and good judgment of line managers. Line management is ultimately responsible for safety and should use their experience and judgment in developing corrective actions, in accordance with site-specific programmatic and ES&H objectives. While the opportunities for improvement in this section may provide line management with insights about potential corrective actions, the site may identify other mechanisms for addressing identified issues.

1. Develop and institutionalize the management tools and systems necessary to implement the LANSCE ISM improvement plan.

- Clearly assign the responsibility for managing and overseeing the development and implementation of the tools and systems needed to implement the LANSCE ISM improvement plan.
- Develop implementation plans and schedules to support the LANSCE ISM improvement plan.
- Institutionalize these processes to address new ISM-related issues, including integration with other management systems and the division's strategic plan.
- Consider the benefits of seeking the perspectives and/or assistance of organizations within LANL (such as TA-55) or request assistance from DOE mentors who have successfully applied such tools/systems.
- Consider the benefits of extending LANSCE's planned use of a tool/system beyond the scope of the strategic planning effort to other activities (e.g., develop an overall resource-loaded and prioritized schedule, supported by detailed milestones, that will provide a clear understanding of actions needed to complete activities identified in the LANSCE ISM improvement plan).
- Consider regularly applying and integrating tools/systems as a standard business practice to continually re-evaluate priorities, allocate resources, and meet ISM implementation objectives. Areas where tools/systems could be applied include: establishing a risk-based process for balancing operational requirements against those associated with facility infrastructure and maintenance; addressing issues associated with implementation of the FSP (e.g., developing and referencing lower-tier documents); prioritizing ES&H staffing issues in light of the limited-resource environment that LANSCE is operating under and the staffing limitations imposed by LANL; addressing infrastructure issues related to aging (e.g., maintenance, experimental systems upgrades, and component replacement); and examining the priority of new issues as they arise.

2. Strengthen the process for flowdown of requirements into LANSCE implementing procedures and work activities, with particular emphasis on institutional requirements.

- Formalize the review of training requirements as an integral part of the institutional process for issuing, managing, and controlling requirements. Re-evaluate the need for any supplemental training for those requirements already issued to improve the effectiveness of their implementation.

- Develop a formal process within LANSCE for the dissemination of new or revised requirements to all affected division organizations. Incorporate implementing guidance and identify any training that may be required to implement a particular requirement. Include the LANSCE training office as a formal part of the LANSCE requirements flowdown process to ensure that any required training is developed and available to affected LANSCE organizations.

- Consider the approach taken by the LANSCE-FM maintenance and operations organization in implementing institutional requirements for possible application to a division-wide process.

- Institute a performance assurance process to provide feedback to management on the effectiveness of flowdown and implementation of requirements within implementing procedures and work activities at LANSCE.

3. Complete the development and implementation of the LANSCE FSP, FTAs, and required authorization basis documents.

- Establish processes for the periodic review and monitoring of group activities to ensure that operations are conducted within operating limits; define and document the methodology for determining the cost of LANSCE-FM services provided to tenants; and communicate group and facility operating limits to all affected organizations, as required by institutional requirements.

- Continue to develop and implement subordinate documents necessary to define safety envelopes and operating limits that can be directly applied to buildings within the facility. Strengthen the integration and reference such subordinate documents in the FSP.

- Complete required authorization basis documentation on a priority basis to ensure that present operations are sufficiently bounded by a safety envelope and operating limits with supporting analyses and documentation.

- Ensure that there is a consistent approach to developing and maintaining safety analysis documents that will envelope current and planned research, experiments, and operations within all facilities.

4. Continue to refine and implement the roles, responsibilities, and authorities of the safety management organization defined in the LANSCE FSP.

- Periodically review the roles, responsibilities, and authorities of the FSP safety management organization and revise them accordingly to reflect the evolving nature of the organization.

- Incorporate the roles, responsibilities, and authorities of the lead tenant position in the FSP.

- Review the roles, responsibilities, and authorities of the EAM and lead tenant positions to strengthen their delegated authority for resolving coordination issues among groups and for monitoring the safety envelope for experimental activities.

- Establish the roles, responsibilities, and authorities of the performance assurance coordinator, authorization basis specialist, and industrial hygienist positions. Include the development and implementation of a LANSCE issues management system and the review of the effectiveness of requirements flowdown as key responsibilities of the performance assurance coordinator.

- Complete the charters, and staff and implement the safety committees/teams described in the LANSCE FSP.

5. Strengthen existing performance feedback and improvement processes.

- Establish a LANSCE formal self-assessment (e.g., division, group, and ES&H) program that routinely targets disciplines, work activities, and problem areas as identified by tracking and trending; and ensures the effectiveness of corrective actions from recurring events or deficiencies (e.g., SEWPs and forklifts).

- Increase the involvement of the ES&H support organizations (FM and LANL ES&H) in routine facility walk-downs and management walk-arounds to minimize recurrence of safety deficiencies identified by the LANSCE stand-down and EH Oversight review.

- Establish a formal critique process and ensure that it is consistent with the requirements of DOE Order 232.1 and DOE Order 5480.19 to assist critique leaders in determining and documenting required information.

- Establish a lessons-learned program that considers lessons learned from all sources at the institutional and divisional level and that ensures integration of lessons learned and required actions into all work activities, with feedback mechanisms to ensure effectiveness.

6. Strengthen the application of the SWP process within the LANSCE division.

- Issue and focus management attention on meeting the guidelines of the SWP LIG, particularly with respect to experimental setup, testing, and disassembly.

- Develop a Web-based "Frequently Asked Questions" process for communicating lessons learned on the SWP process.

- Improve the rigor of the experimental review, change control, and documentation process for experiments associated with the accelerator beam, other experiments, and research and experimental work not covered by HCPs.

- Increase management attention on effective SWP application to activities involving maintenance and testing of R&D programmatic equipment (Lujan lessons learned).

- Improve work inventories to include better specificity for work locations, authorizing authority and dates, and reference to LANL procedures for non-HCP work, as applicable.

7. Improve the LANSCE hazard identification and analysis process in the areas of documentation and ES&H involvement.

- Ensure that the description of work in experiments is sufficiently detailed to adequately identify and analyze the hazards. This is particularly needed for work descriptions for experimental setup and disassembly, and work breakdown for larger projects.

- Enhance the LANSCE hazard analysis process by ensuring that both beam- and non-beam-related experiments have comprehensive processes that result in consistently adequate controls for similar hazards. Ensure adequate documentation for all aspects of the analysis, including initial hazard screening and evaluation of common industrial hazards, as applicable. Consider increased use of hazard screening checklists comparable to those required for LANSCE facility work activities.

- Increase the involvement of LANSCE ES&H in the following areas: early stages of hazard identification and analysis, facility hazard identification by means of walk-throughs and assessments, and advisement of regulatory requirements. Develop ES&H thresholds for guidance to group leaders on the involvement of ES&H professionals in work activities.

- Develop a process for reviewing and approving changes in the experimental work package when hazards change.

8. Improve the identification and implementation of institutional controls at LANSCE facilities.

- Improve the documentation of hazard controls on the safety review worksheet and the linkage of hazard controls to institutional requirements.

- Develop building emergency plans that satisfy the applicable regulatory requirements and include useful occupant emergency information, such as expected alarm response for all experiments within the building, alarm testing, evacuation procedures and rally points for all areas in which researchers could be working. Ensure that HCPs consistently describe emergency actions in a format that will produce the appropriate response.

- Identify hazard controls for each individual hazard. The control(s) should be documented in proximity to the identification of the hazard.

- Define the research-related training requirements for common industrial hazards, such as hazardous chemicals, dust, noise, ergonomics, movement of lead, and working at elevated heights.

- Provide greater focus on implementation of requirements and training for purchasing, storing, tracking, and disposing of hazardous chemicals, including legacy and surplus chemicals from completed or abandoned experiments.

9. Accelerate the development and issuance of institutional requirements and guidance to address important safety-related areas not adequately addressed in the current set of requirements and guidance.

- Ensure that LANSCE adequately addresses startup, restart, and change control (unreviewed safety issue process) of nuclear and non-nuclear facilities, pursuant to the recently approved LIR for non-nuclear facility safety authorization.

- Follow the guidance in the LIG for SWP implementation.

- Correct the deficiencies in the LIR for stop-work identified during the 1998 Office of Oversight review and this review, and implement the revised LIR.

- Finalize, reissue, and implement the draft LDIR that addresses requirements for the approval of unlisted electrical equipment to ensure that new and legacy equipment is safe for its intended use. Institutionalize the UL guidance to address non-UL equipment across LANL.

APPENDIX A
ISSUES FOR CORRECTIVE ACTION AND FOLLOW-UP

Line management is responsible for correcting deficiencies and addressing weaknesses identified by Office of Oversight reviews. Following each review, line management prepares a corrective action plan. The Office of Oversight follows up on significant issues as part of a multifaceted follow-up program that involves follow-up reviews, site profile updates, and tracking of individual issues.

This appendix summarizes the significant issues identified in this report of the follow-up review of LANL. The issues identified in Table A-1 will be formally tracked in accordance with the DOE plan developed in response to Defense Nuclear Facilities Safety Board Recommendation 98-1, which addressed follow-up of independent Oversight findings. AL, LAAO, and LANL need to specifically address these issues in the corrective action plan.

During a focused review, the Office of Oversight team may identify isolated weaknesses and/or minor deficiencies in otherwise effective programs. Although the site needs to correct such weaknesses and deficiencies, the Office of Oversight does not include every identified weakness in the formal tracking system. However, all weaknesses and deficiencies are considered as part of the Office of Oversight follow-up program when evaluating safety management performance and planning future Oversight evaluation and follow-up activities.

Table A-1. Issues Identified in Focused Review

IDENTIFIER	ISSUE STATEMENT	REFER TO PAGES
AL-LANL-REVIEW-99-1	LANSCE does not have a sufficiently formal process for dissemination of requirements that ensures that all new and modified requirements effectively flow down to the work activity level and are reviewed to determine training and guidance needed to support implementation, in accordance with LIR 301-00-01.9, "Issuing and Managing Laboratory Operations Implementation Requirements and Guidance." The effective flowdown of requirements has also been hindered by other institutional factors, including the high rate at which institutional requirements have been promulgated, the lack of sufficient ES&H subject matter expert involvement, and lack of sufficient institutional guidance in some cases.	15-17
AL-LANL-REVIEW-99-2	The LANSCE FSP and associated FTAs do not fully meet the intent of applicable LANL requirements, including requirements for identifying safety envelopes and operating limit information, and analyzing aggregate hazards between and within multi-tenant buildings.	17-18
AL-LANL-REVIEW-99-3	LAAO, LANL, and LANSCE have not effectively managed the review, development, and approval process for authorization basis documents in a timely manner, in accordance with applicable DOE requirements and standards.	18-19
AL-LANL-REVIEW-99-4	The LANSCE hazard analysis process does not provide for sufficient documentation and ES&H subject matter expert involvement, consistent with the LANL SWP requirements documents, when identifying and analyzing some industrial and radiological hazards (e.g. working at elevated heights and exposing materials to the neutron beam).	23-25

Table A-1. Issues Identified in Focused Review (Continued)

IDENTIFIER	ISSUE STATEMENT	REFER TO PAGES
AL-LANL-REVIEW-99-5	At LANSCE, institutional controls (e.g., procedures and training) for some work activities are not adequately identified, documented, or linked to work activities. Clear linkage of LANL institutional requirements and controls to work activities is required by the LANL ISM description document.	26-28
AL-LANL-REVIEW-99-6	At LANSCE, comprehensive building emergency plans have not been fully developed or demonstrated to be effective through documented drills and exercises, as required by applicable OSHA and DOE order requirements.	28-29
AL-LANL-REVIEW-99-7	At LANL, the stop-work procedures do not fully implement the requirements of DOE Order 440.1A and the intent of DOE Order 5480.19, as referenced in institutional requirements. This weakness was previously identified by the Office of Oversight.	34
AL-LANL-REVIEW-99-8	LANL institutional processes for critiques do not fully implement DOE Order 232.1 requirements for investigation of abnormal events. The lack of a formal process demonstrated the need for more effective critique processes, as observed by Oversight at the division level.	34-35
AL-LANL-REVIEW-99-9	At LANSCE, an effective self-assessment program, consistent with DOE requirements for self-assessments (as delineated in LIR 307-01-01, "Safety Self-Assessment") is not in place to provide continued assurance that ISM, particularly SWPs, remains adequately implemented and is continuously improved at the group and activity levels.	36

APPENDIX B
JUDGMENTS OF NEED

Line management is responsible for addressing JONs resulting from accident investigations. The Type A microwave accident investigation identified eight JONs applicable to LANSCE. The 1998 Office of Oversight accident investigation follow-up review determined that five of the eight JONs were not fully satisfied. Table B-1 lists the five microwave accident JONs that were determined to be not fully satisfied and includes their current status and the team's evaluation.

Table B-1. Judgments of Need Not Fully Satisfied from the 1998 EH Accident Investigation Follow-up Review

JON	Judgment of Need	Site Status	1999 EH Follow-up Review Status and Evaluation
JON 2A	LANL needs to promptly implement corrective actions to address the lessons learned from this and other accidents.	Closed	JON satisfied. LANL made numerous improvements in the lessons-learned program that has improved the development and dissemination of lessons-learned information. • A user-friendly Web-based system was implemented. • The system is linked to employee concerns, Price-Anderson, Occurrence Reporting and Processing System, DOE lessons learned, smart safety, and other related Web systems. • The management walk-around program and assessment findings are being reviewed for lessons learned. • The number of lessons learned "alerts" published on the DOE lessons-learned server has significantly increased. • The Web-based system with subject and text search capability makes lessons-learned information immediately available for work planning and hazard identification. • Processes at the division and group level for documenting implementation of lessons-learned information still require improvement.
JON 2B	LANL needs to assure that lessons learned are applied across all elements of the laboratory.	Closed	JON satisfied. • The improvements in the lessons-learned program have resulted in improved dissemination and utilization of lessons learned across the laboratory. • Interviews indicated that users of the lessons-learned Web-based system believed the system was much improved. • A few deficiencies were identified where lessons-learned information was disseminated but not effectively used by some LANL organizational elements.

Table B-1. Judgments of Need Not Fully Satisfied from the 1998 EH Accident Investigation Follow-up Review (Continued)

JON	Judgment of Need	Site Status	1999 EH Follow-up Review Status and Evaluation
JON 4	LANL needs to develop and implement a comprehensive Fitness for Duty (FFD) program for personnel involved in hazardous operations and their supervisors.	Closed	JON satisfied. • LANL procedure AM-903, FFD, addresses the procedural requirements for processing personnel if FFD is in question. • Laboratory-wide training on FFD was conducted and FFD information was integrated into LANL general employee training. • Supervisors and workers interviewed were knowledgeable of FFD requirement for access to and working at LANL. • FFD information was presented to experimental users during a pre-experiment briefing attended by evaluators.
JON 6	The Accelerator Operations and Technology (AOT) division needs to establish, communicate, and implement safety roles and responsibilities.	Closed	JON satisfied. • Implementation of ISM, the FSPs, FTAs, and SWP and associated training has documented and proceduralized safety roles and responsibilities. • LIRs and LIGs implemented since the accident further document assignment of roles, responsibility, and authority for aspects of safety addressed by the LIR (e.g., electrical safety, change control, etc.) • Corrective actions, lessons learned, and the IVP process from the management self-directed stand-down of LANSCE has further clarified responsibilities within LANSCE groups. • The SAD referenced by the FSP requires completion, and the FSP and FTAs require refinement and improvement to ensure that building operational limits are defined, communicated, and adhered to by all tenant organizations.
JON 7	The AOT division needs to correct deficiencies in the AOT-9 group electrical safety training program and needs to review the status of training in other groups within the division.	Closed	JON satisfied. • There has been improvement in training completion rates for electrical safety training across the laboratory and particularly at LANSCE. • LANSCE personnel have been actively involved in resolving electrical issues raised with the LANL Electrical Safety Committee.

Table B-1. Judgments of Need Not Fully Satisfied from the1998 EH Accident Investigation Follow-up Review (Continued)

JON	Judgment of Need	Site Status	1999 EH Follow-up Review Status and Evaluation
JON 7 (Cont'd)			• LANSCE groups have improved the consistency of electrical on-the-job training. • Electrical safety training/retraining is complete for all LANSCE groups. • The LANL electrical safety committee regularly assesses the electrical safety program, including training completion rates and division performance annually. The most recent assessment, completed in September 1999, was comprehensive. • Although electrical safety has improved, increased attention is needed to ensure that SEWP requirements are fully, effectively, and rigorously implemented.
JON 8	AOT-9 needs to determine why procedures were not followed and implement necessary controls to prevent a recurrence.	Closed	JON satisfied. • Management has made good progress in improving adherence to institutional and divisional requirements. The implementation of ISM, the five core functions, and SWPs has greatly increased the formality and rigor applied to research, research-related work, and experimental activities. • Management is firmly committed to ISM and less tolerant of deviations from the program and procedures. • The cultural attitude and acceptance of more rigorous programs has improved. • The accident and injury rate is declining and below the DOE average. • The development of work inventories and upgrade of standard operating procedure to more rigorous HCPs have improved definition and control of work activities with procedures that are easier to follow. • Adherence to all LANL requirements is addressed in LANL and division-specific employee training. • Continued management attention is required at all organizational levels to ensure continued rigorous adherence to all procedures and requirements.

APPENDIX C
EVALUATION PROCESS AND TEAM COMPOSITION

The evaluation was conducted according to formal protocols and procedures, including the Appraisal Process Guide, which provides the general procedures used by the Office of Oversight program for conducting inspections and reviews, and the Focused Review Plan, which outlines the scope and conduct of the review process. Planning sessions were conducted to ensure that all team members were informed of the review objectives, procedures, and methods. The planning process considered previously identified weaknesses, current DOE AL/LAAO and LANL activities, and AL and LANL management initiatives. The evaluation team collected data through interviews, document reviews, walk-downs, observation of activities, and performance testing. Interviews were conducted with LAAO and LANL managers, team leaders, facility tenants, scientists, users, and safety and facility management personnel.

The Oversight evaluation and report provides an assessment of selected management system areas within LANSCE related to line management implementation of ISM: line management responsibility for safety; clear roles, responsibilities, and authorities; and identification and flowdown of requirements, including FSP implementation. In addition, an examination of the five core functions of the ISM, which are essential to effective R&D work planning, was conducted:

1. Define Work
2. Analyze Hazards
3. Develop and Implement Controls
4. Perform Work Within Controls
5. Feedback and Continuous Improvement.

Team Composition

The team membership, composition, and responsibilities were as follows:

Deputy Assistant Secretary for Oversight

S. David Stadler

Associate Deputy Assistant Secretary for Oversight

Raymond Hardwick – Operations
Neal Goldenberg – Technical

Director, Office of ES&H Evaluations

Patricia Worthington, Acting Director
Tom Staker, Acting Deputy Director

Team Leader

Bob Freeman

ISM Implementation and Core Functions

Adrian Gardner
Bernard Kokenge
Mark Good
Jim Lockridge

Administrative Support

Tom Davis
Dana Sackett
Lee Roginski

Quality Review Board

Raymond Hardwick
Tom Staker
Patricia Worthington